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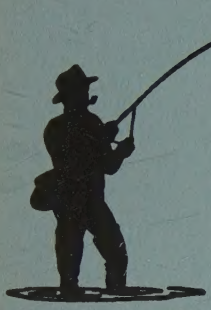

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SPORT FISHERY ABSTRACTS

Vol. 24, No. 2, 1979

DEPARTMENT OF THE INTERIOR
U. S. FISH AND WILDLIFE SERVICE

UNITED STATES DEPARTMENT OF THE INTERIOR
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SPORT FISHERY ABSTRACTS

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Sport Fishery Abstracts is intended to furnish fishery biologists with abstracts of current literature in sport fishery research and management.

One volume, consisting of four numbers, is issued each year. Each number contains separate Author, Geographic, and Taxonomic indexes, and the final number of each volume contains cumulative Author, Geographic, Taxonomic, and Subject indexes, and a list of publications screened. Authors who publish in journals not screened for *Sport Fishery Abstracts*, and who would like their publications included, should submit abstracts to the Editor.

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SPORT FISHERY ABSTRACTS

An abstracting service for fishery research and management

Volume 24 Number 2 1979

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AQUATIC PLANTS AND THEIR CONTROL

79-000814 Avault, J. W., Jr.; Merkowsky, A. EVALUATION OF HYBRID (COMMON X GRASS) CARP FOR WEED CONTROL. In R. O. Smitherman, W. L. Shelton, and J. H. Grover, Eds. Culture of Exotic Fishes Symposium Proceedings. Fish Cult. Sect., Am. Fish. Soc., Auburn, Ala. p. 184-193. 1978. Proceedings available at 5.00 from Fish Cult. Sect., Am. Fish. Soc., c/o Dep. Fish. Allied Aquacult., Auburn Univ., Auburn, AL 36830]

[Sch. For. Wildl. Manage., La. State Univ., Baton Rouge 70803] Male grass carp (/Ctenopharyngodon idella/) were crossed with carp (/Cyprinus carpio/), and a reciprocal cross was made. When the maternal parent was the grass carp, fry never began to feed and all died. Low survival of fry was noted when the maternal parent was the carp. The male grass carp x female carp hybrid suffered gradual attrition in ponds, possibly because of a genetic factor. This hybrid however, readily produced F(2)'s when hormone injections were used. In aquaria, hybrid carp were offered various aquatic plants, and food preferences were established. Preliminary tests for weed control in ponds were conducted, but data have not been published. Salinity tolerances of hybrid carp in aquaria were established. Hybrid fingerlings survived up to 5 hours at 20 ppt, up to 10 hours at 18 ppt, up to 72 hours at 16 ppt, and at least 12 days at 15 ppt. Two studies were conducted to determine the effect of hybrid grass carp on channel catfish (/Ictalurus punctatus/) production in replicated ponds--one where catfish were fed and one where catfish were not fed. In the study with feeding, hybrid carp stocked at 50 per ha or 100 per ha with channel catfish at 4,370 per ha did not affect growth or production of channel catfish. In the study with no feeding, hybrid carp stocked at 50 per ha or 100 per ha with channel catfish at 750 per ha did significantly decrease channel catfish growth and production.--from abstr.

79-000815 Stevenson, J. C.; Confer, N. M. SUMMARY OF AVAILABLE INFORMATION ON CHESAPEAKE BAY SUBMERGED VEGETATION. U.S. Fish Wildl. Serv. FWS/OBS-78/66. xxii + 335p. Aug. 1978. SFA 24(2)

[Univ. Md., Horn Point Environ. Lab., Box 775, Cambridge, MD 21613]

GENERAL FISH CULTURE

79-000816 Bravo, S. A. STUDY OF THE BANGUS FISHING INDUSTRY: PROSPECTS AND PROBLEMS, BENEFIT-COST ANALYSIS APPROACH. Philipp. J. Fish. 14 (1): 57-87. Jan.-June 1976. SFA 24(2)

[Natl. Econ. Dev. Auth., Manila, Philippines]

79-000817 FAO of the UN. REPORT OF THE TECHNICAL CONFERENCE ON AQUACULTURE. KYOTO, JAPAN, 26 MAY-2 JUNE 1976. FAO Fish Rep. No. 188. iii + 93p. Dec. 1976. SFA 24(2)
[Rome, Italy]

79-000818 Geffen, A. ROTATING FISH CAGES TO PREVENT FOULING. Aquaculture 16 (1): 83-85. Jan. 1979. SFA 24(2)
[Israel Oceanogr. Limnol. Res. Ltd., Maricult. Lab., P.O.B. 1212, Eilat, Israel]

79-000819 Inaba, D. [PRESENT STATUS AND FUTURE PROSPECTS OF LARGE SCALE CULTURE AND PROPAGATION OF IMPORTANT AQUATICS IN JAPAN.] In S. Motoda, ed. Propagation of Marine Resources of the Pacific Ocean. First Japan-USSR Joint Symp. Aquacult. Pac. Ocean: 1-4 Dec. 1972, Tokyo and Shimizu, Japan. p. 7-12. Sept. 1973. In Japanese with English summ. SFA 24(2)
[Fac. Agric. Vet. Sci., Nihon Univ., Tokyo, Japan]

79-000820 Matsuda, Y. THE GROWTH OF AQUACULTURE IN DEVELOPING COUNTRIES: POTENTIALS, PATTERNS, AND PITFALLS. Fisheries (Bull. Am. Fish. Soc.) 3 (4): 2-4, 6. July-Aug. 1978. SFA 24(2)
[Woods Hole Oceanogr. Inst., Woods Hole, MA] The expectations for advances in aquaculture throughout the world have not taken into account the constraints of human abilities. Sustained aquaculture development depends on three essential components: basic conditions (supply and demand, environmental suitability, technical capability, legality, experience, and quality of leadership): infrastructure; and short term economic feasibility. Unitl the industry reaches the "take-off" stage, the growth of aquaculture is a slow, step-by-step process. elimination of any one of the limiting factors will contribute somewhat to this growth, but not much. Nevertheless, the best way to develop aquaculture is to eliminate the limiting factors one by one.

TROUT AND SALMON CULTURE

79-000821 Leon, K. A.; Bonney, W. A. ATLANTIC SALMON EMBRYOS AND FRY: EFFECTS OF VARIOUS INCUBATION AND REARING METHODS ON HATCHERY SURVIVAL AND GROWTH. Prog. Fish-Cult. 41 (1): 20-25. Jan. 1979. SFA 24(2)
[Alaska Dep. Fish Game, Juneau 99801]

79-000822 Meade, T. L. ENVIRONMENTAL PARAMETERS AFFECTING FISH PHYSIOLOGY IN WATER REUSE SYSTEMS. Mar. Fish. Rev. 40 (10): 46-47. Oct. 1978. SFA 24(2)
[Dep. Anim. Sci., Univ. R.I., Kingston 02881]

79-000823 Moody, T. M.; McCleskey, R. N. VERTICAL RACEWAYS FOR PRODUCTION OF RAINBOW TROUT. N.M. Dep. Game Fish Bull. No. 17. x + 38p. 1978. SFA 24(2)
[N. Mex. Dep. Game Fish, Santa Fe 87503] Rearing rainbow trout in vertical raceways was compared with rearing them in conventional horizontal raceways for significant differences in rate of trout growth, cost efficiency, and various physical and chemical parameters. In vertical raceways, trout increased in size and weight more rapidly, although they required more feed per pound of weight gained and

79-000823 CONTINUED
vertical raceways proved unsuitable for handling rainbow trout shorter than five inches. Trout mortality did not differ significantly between the two methods. Even with higher densities of fish per unit of water volume, water quality in the vertical raceways remained more suitable for trout than that in horizontal raceways. Despite higher feed requirements, vertical raceways proved more cost-efficient because of significant savings in man-hours required.

79-000824 Sano, S. [SOME PROBLEMS ON THE ARTIFICIAL PROPAGATION OF PACIFIC SALMON.] In S. Motoda, ed. Propagation of Marine Resources of the Pacific Ocean. First Japan-USSR Joint Symp. Aquacult. Pac. Ocean: 1-4 Dec. 1972, Tokyo and Shimizu, Japan. p. 73-81. Sept. 1973. In Japanese with English summ. SFA 24(2)
[Assoc. Technol. Dev. Fish. Res. Hokkaido, Sapporo, Japan]

79-000825 Sparre, P. A MARKOVIAN DECISION PROCESS APPLIED TO OPTIMIZATION OF PRODUCTION PLANNING IN FISH FARMING. Medd. Dan. Fisk.- Havunders. 7: 111-197. 1976. SFA 24(2)
[Danish Inst. Fish. Mar. Res., Charlottenlund Castle, DK-2920 Charlottenlund, Denmark] In the following paper a mathematical model of a Danish trout farm is given. The main emphasis has been placed on the biological aspects, and their relations to the economic aspects. On the basis of the mathematical model an algorithm for optimization of the production strategy is generated. the algorithm is implemented in FORTRAN. The problem discussed is of the category: "Optimal exploitation of limited resources (water supply, temperature, oxygen etc.)". Stategies consist of decisions like for instance dates for purchase of fingerlings and sale of portion sized trouts, stocksize and feeding.

79-000826 Sperber, O.; From, J.; Sparre, P. A METHOD TO ESTIMATE THE GROWTH RATE OF FISHES, AS A FUNCTION OF TEMPERATURE AND FEEDING LEVEL, APPLIED TO RAINBOW TROUT. Medd. Dan. Fisk.- Havunders. 7: 275-317. 1977. SFA 24(2)
[Danish Trout Cult. Res. Stn., Brons, 6780 Skaerbaek, Denmark] Using young rainbow trout, estimates of the parameters in a physiological growth equation were provided by aquaria experiments. In connection with a previous paper on production planning of fish farms, it is of paramount importance to solve the following problem: If on a given date, a trout has a given weight, which weight will the trout have obtained at a certain later date, when the temperature of the water has a certain degree and when the trout is given a certain quantity of food? The main emphasis has been placed on the numerical prediction of growth patterns, rather than on giving physiological or ethological explanations to the observed growth patterns.

OTHER ANADROMOUS SPECIES CULTURE

79-000827 Headrick, M. R. A CULTURE OF STRIPED BASS FROM THE CHESAPEAKE AND DELAWARE CANAL. Special Report for Delmarva Power and Light Co. v + 39p. 1978. SFA 24(2)
[Dep. Environ. Aff., Delmarva Power and Light Co., 800 King St., Wilmington, DE 19889] The culture of striped bas was investigated to evaluate the feasability of stocking as a method of mitigating entrainment impact of the proposed Summit Generating Station of Delmarva Power and Light Company. Given a water supply of suitable chemical content and temperature, propagation of striped bass from the

79-000827 CONTINUED
Chespaeake and Delware (C&D) Canal and rearing of 1-2 inch fingerlings in ponds appeared feasable. In 1976, 16 female and 100 male striped bass from the C&D Canal were brought to the Summit Hatchery. Viable eggs obtained from two females were too buoyant to incubate in McDonald jars and died in aquaria after failure of the water system. In 1977, 18 females and 70 males were brought to the hatchery, where nine females produced about 3 million eggs. The buoyant eggs were successfully incubated in oxygen-aerated penicillin-streptomycin solution and produced about 2.1 million prolarvae. Virtually all larvae produced from the first eight females were killed by extremes in temperature. One female captured on 4 May produced about 35,000 larvae, and most were stocked in two 1/2-acre ponds on 17 May. The ponds were drained on 7 and 8 July and 809 fingerlings weighing a total of 3.0 kg were havested. The Summit Hatchery in 1977 also produced the first hybrids of a female white perch and male striped bass and the first known hatching of striped bass eggs after premature rupture of the chorion. Efforts to date indicate a fully equipped hatchery could consistently produce larval or juvenile striped bass in numbers sufficient to mitigate losses due to withdrawal of cooling water from the C&D Canal. The most important requirement for the above hatchery would be water of suitable quality and effective temperature control.--from abstr.

WARMWATER CULTURE

79-000828 Anderson, C. E. PRODUCTION OF NORMAL MALE AND ANDROGEN SEX-REVERSED /TILAPIA AUREA/ AND /T. NILOTICA/ FED A COMMERCIAL CATFISH DIET IN PONDS. Ph.D. dissertation, Auburn Univ. 48p. 1978. From Diss. Abstr. Int. B Sci. Eng. 39(6):2583. Dec. 1978. SFA 24(2)

79-000829 Bishara, N. F. FERTILIZING FISH PONDS. III. GROWTH OF /MUGIL CAPITO/ IN EGYPT BY POND FERTILIZATION AND FEEDING. Aquaculture 16 (1): 47-55. Jan. 1979. SFA 24(2)
[Inst. Oceanogr. Fish., Alexandria, Egypt]

79-000830 Ellis, J. E.; Tackett, D. L.; Carter, R. R. DISCHARGE OF SOLIDS FROM FISH PONDS. Prog. Fish-Cult. 40 (4): 165-166. Oct. 1978. SFA 24(2)
[U.S. FWS, P.O. Box 95067, Atlanta, GA 30347]

79-000831 Greenland, D. C.; Carter, R. R.; Gill, R. L.; Tackett, D. L.; Ellis, J. E. HARVESTING MONOSEX GRASS CARP. Prog. Fish-Cult. 41 (1): 50. Jan. 1979. SFA 24(2)
[U.S.FWS, Fish Farm. Exp. Stn., P.O. Box 860, Stuttgart, AR 72160]

79-000832 Romaire, R. P.; Boyd, C. E.; Collis, W. J. PREDICTING NIGHTTIME DISSOLVED OXYGEN DECLINE IN PONDS USED FOR TILAPIA CULTURE. Trans. Am. Fish. Soc. 107 (6): 804-808. Nov. 1978. SFA 24(2)
[Dep. Fish. Allied Aquacult., Auburn Univ., Auburn, AL 36830]

79-000833 Thomas, A. E.; Carter, R. R.; Greenland, D. C. SURVIVAL OF ONE- AND TWO-YEAR-OLD MONOSEX GRASS CARP IN SMALL PONDS. Prog. Fish-Cult. 41 (1): 38. Jan. 1979. SFA 24(2)
[Bur. Land Manage., NPR-A Planning, 1007 W. Third Ave., Anchorage, AK 99501]

79-000834 Tucker, C. S.; Boyd, C. E. EFFECTS OF SIMAZINE TREATMENT ON CHANNEL CATFISH AND BLUEGILL PRODUCTION IN PONDS. Aquaculture 15 (4): 345-352. Dec. 1978. SFA 24(2)
[Dep. Fish. Allied Aquacult., Agric. Exp. Stn., Auburn, AL]
Application of 13.4 kg/ha of simazine to the bottom of channel catfish (/Ictalurus punctatus/) ponds before flooding resulted in an extended period of low disolved oxygen, a 19 percent reduction (P less than 0.01) in channel catfish yield, and poorer feed conversion by fish when compared to control ponds. A single application of 1.5 mg/l of simazine to the water of fertilized bluegill (/Lepomis macrochirus/) ponds also decreased dissolved oxygen. The 11 percent reduction in bluegill yield was not statistically significant (P greater than 0.05).
Simazine treatment caused an initial reduction in macrophyte coverage in bluegill ponds, but macrophyte coverage increased as simazine concentrations in the pond water declined.

79-000835 Wright, C. W.; Coke, M. M. THE ARTIFICIAL PROPAGATION OF /BARBUS NATALENSIS/: 1: INDUCED SPAWNING AND ARTIFICIAL FERTILISATION. Lammergeyer No. 22. p. 37-41. Oct. 1975. SFA 24(2)
[Moor Park Nat. Reserve, Estcourt, 3310 South Africa]

MARICULTURE

79-000836 Alikunhi, K. H.; Ranoemihardjo, B. S.; Poernomo, A.; Hamami, E. PRELIMINARY OBSERVATIONS ON REARING OF MILKFISH FRY ON PLANKTON IN CEMENT TANKS AND PLASTIC POOLS. Bull. Shrimp Cult. Res. Cent. (Jepara) 1 (1): 40-45. Jan. 1975. SFA 24(2)
[Shrimp Cult. Res. Cent., Jepara, Indonesia]

79-000837 Angeles, H. G. A REPORT ON THE OBSERVATION OF BANGUS (MILKFISH) FRY INDUSTRY IN MINDORO ORIENTAL. Philipp. J. Fish. 14 (1): 107-116. Jan.-June 1976. SFA 24(2)
[Bur. Fish. Aquatic Resour., Manila, Philippines]

79-000838 Ayushin, B. N. [EXPERIMENTS ON THE SPAWNING OF PACIFIC SAURY ON AN ARTIFICIAL SPAWNING BED IN JAPAN SEA.] In S. Motoda, ed. Propagation of Marine Resources of the Pacific Ocean. First Japan-USSR Joint Symp. Aquacult. Pac. Ocean: 1-4 Dec. 1972, Tokyo and Shimizu, Japan. p. 67-72. Sept. 1973. In Russian with Japanese summ. SFA 24(2)
[TINRO, Vladivostok, USSR]

79-000839 De Jesus, A. S.; Deanon, R. R. SURVEY OF BANGUS AND SUGPO FRY GROUNDS AND OTHER MARINE RESOURCES OF SUEZON AND BICOL PROVINCES. Philipp. J. Fish. 14 (1): 88-106. Jan.-June 1976. SFA 24(2)

79-000840 Garza, G.; Bailey, W. H.; Lasswell, J. L. REARING OF BLACK DRUM IN FRESH WATER. Prog. Fish-Cult. 40 (4): 170. Oct. 1978. SFA 24(2)
[Tex. Parks Wildl. Dep., Heart of the Hills Res. Stn., Jct. Star Rt., Box 62, Ingram 78025

79-000841 Inoue, M. [RECENT TRENDS IN ARTIFICIAL PROPAGATION OF TUNAS.] In S. Motoda, ed. Propagation of Marine Resources of the Pacific Ocean. First Japan-USSR Joint Symp. Aquacult. Pac. Ocean: 1-4 Dec. 1972, Tokyo and Shimizu, Japan. p. 57-66. Sept. 1973. In Japanese with English summ. SFA 24(2)
[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Japan]

79-000842 Lasswell, J. L.; Lyons, B. W.; Bailey, W. H. HORMONE-INDUCED SPAWNING OF SOUTHERN FLOUNDER. Prog. Fish-Cult. 40 (4): 154. Oct. 1978. SFA 24(2)
[Tex. Parks wildl. Dep., Heart of the Hills res. Stn., Junction Star Route, Box 62, Ingram 78025]

79-000843 Padlan, P. G.; Ranoemihardjo, B. S.; Hamami, E. IMPROVED METHODS OF MILKFISH CULTURE. I. INCREASING PRODUCTION IN SHALLOW, UNDRAINABLE BRACKISH-WATER PONDS. Bull. Shrimp Cult. Res. Cent. (Jepara) 1 (1): 33-39. Jan. 1975. SFA 24(2)
[Shrimp Cult. Res. Cent., Jepara, Indonesia]

79-000844 Ranoemihardjo, B. S.; Poernomo, A.; Alikunhi, K. H. OBSERVATIONS ON MILKFISH CULTURE IN DEEP WATER, ENCOURAGING PLANKTON GROWTH. Bull. Shrimp Cult. Res. Cent. (Jepara) 1 (1): 12-18. Jan. 1975. SFA 24(2)
[Shrimp Cult. Res. Cent., Jepara, Indonesia]

79-000845 Shafland, P. L. SELF-CONTAINDED UPWELLING SYSTEM FOR REARING LARVAL FISHES IN THE LABORATORY. Prog. Fish-Cult. 41 (1): 10-13. Jan. 1979. SFA 24(2)
[Fla. Game Fresh Water Fish Comm., Boca Raton 334311]

79-000846 Smigielski, A. S. INDUCED SPAWNING AND LARVAL REARING OF THE YELLOWTAIL FLOUNDER, /LIMANDA FERRUGINEA/. NOAA Fish. Bull. 76 (4): 931-936. 1979. SFA 24(2)
[NMFS, R.R. 7A, Box 522A, Narragansett, RI 028821]

79-000847 Teng, S.-K.; Chua, T.-E. EFFECT OF STOCKING DENSITY ON THE GROWTH OF ESTUARY GROUPER, /EPINEPHELUS SALMOIDES/ MAXWELL, CULTURED IN FLOATING NET-CAGES. Aquaculture 15 (3): 273-287. Nov. 1978. SFA 24(2)
[Sch. Biol. Sci., Univ. Sains Malaysia, Penang, Malaysia] Studies on the effect of stocking density on the growth of estuary grouper (/Epinephelus salmoides/) were conducted in floating net-cages. Four stocking densities (15, 30, 60 and 120 fish/m^3) and two sizes of fish (26 ± 0.2 gm and 15.2 ± 0.1 gm) were studied. Results of the present study indicate that fish at the stocking density of 60 fish/m^3 grew

79-000847 CONTINUED
equally fast and showed comparable food conversion ratio and survival rate as those at lower stocking densities of 15 and 30 fish/m^3. The net-yeild of fish at a stocking density of 60 fish/m^3 was 1.9 and 3.5 times that of fish at densities of 30 and 15 fish/m^3, respectively. However, at 120 fish/m^3, a remarkable decrease in the weight-gain per fish, mean fish weight, efficiency of food conversion as well as survival rate was recorded. The possible effects of stocking density on the growth of estuary grouper under cage-culture conditions were discussed.

79-000848 Tseng, W. Y. PRIMARY STUDY ON THE INDUCED BREEDING OF BLACK PORGY, /MYLIO MACROCEPHALUS/ (BASILEWSKY) IN HONG KONG. Am. Zool. 18 (3): 606. 1978. Abstract only. SFA 24(2)
[Chinese Univ. Hong Kong, Shatin, N.T., Hong Kong]

FEEDS, FEEDING AND NUTRITION

79-000849 Appelbaum, S.; Dor, U. TEN DAY EXPERIMENTAL NURSING OF CARP (/CYPRINUS CARPIO/ L.) LARVAE WITH DRY FEED. Bamidgeh 30 (3): 85-88. Sept. 1978. SFA 24(2)
[Univ. Hamburg, West Germany]

79-000850 Austreng, E. FAT-CONTAINING BLEACHING EARTH AS A FEED CONSTITUENT FOR RAINBOW TROUT. Aquaculture 15 (4): 333-343. Dec. 1978. SFA 24(2)
[Dep. Poultry Fur Anim. Sci., Agric. Univ. Norway, 1432 A-NLH, As, Norway] Fat-containing bleaching earth (FBE) is a waste product from the bleaching of edible oils in the fat industry. The experiments described were carried out to investigate if FBE may be utilized as an ingredient in feed for rainbow trout (/Salmo gairdneri/, Richardson). Using bomb calorimetry, a sample of FBE from the bleaching of marine oils was found to contain 3400 kcal/kg. This indicates a fat content of about 36 percent even though analysis showed an extractable crude fat content of only 23 percent. The digestibility of the crude fat was estimated at about 80 percent. Fish growth was very good on all four experimental diets, which contained 0, 10, 20, and 30 percent FBE. Level of dietary FBE had no measurable effect on fish mortality, condition factor, dressed-out weight, fat content, or fatty acid composition. Fish fed diets containing FBE showed a significantly higher frequency of discoloured livers than fish fed control diets, indicating that the quality of the fat in FBE might be reduced. An organoleptic evaluation conducted on the fish showed differences between fish fed different diets, but no negative effects of FBE.

79-000851 Ghittino, P. FORMULATION AND TECHNOLOGY OF MOIST FEED. Riv. It. Piscic. Ittiop. 13 (4): 107-112. Oct.-Nov.-Dec. 1978. In English and Italian. SFA 24(2)
[Fish Dis. Lab., Ist. Zoopr. Spec. Piem. Lig., Via Bologna 148, 10154 Torino, Italy] Fresh or mixed diets allowed the starting of fish rearing. Complex researches were undertaken to discover dry foods for fish. This involved studies to establish nutritional requirements for salmonids firstly, and such investigations represent a basis for examining the needs of other reared fish, such as warm water fishes. Dry commercial pellets for fish are largely and routinely feasible. Wet or moist feeds are still used for salmon, eels, marine fishes. They appear more economic, palatable to fish, in spite that they are more perishable and less regularly supplied. If good binders will be

79-000851 CONTINUED
economically available, the conversion will increase and pollution reduced. The health and hedonic characteristics of produced fish through moist feeding should be primarily considered in a near future.

79-000852 Jones, P.; Hislop, J. R. G. FURTHER OBSERVATIONS ON THE RELATION BETWEEN FOOD INTAKE AND GROWTH OF GADOIDS IN CAPTIVITY. J. Cons. Cons. Int. Explor. Mer 38 (2): 244-251. Nov. 1978. SFA 24(2)
[Mar. Lab., P.O. Box 101, Aberdeen AB9 8DB, England]

79-000853 Ketola, H. G. NUTRITIONAL REQUIREMENTS AND FEEDING OF SELECTED COOLWATER FISHES: A REVIEW. Prog. Fish-Cult. 40 (4): 127-132. Oct. 1978. SFA 24(2)
[U.S. FWS, Tunison Lab. Fish Nutr., Cortland, NY 13045]

79-000854 Lovell, R. T.; Li, Y.-P. ESSENTIALITY OF VITAMIN D IN DIETS OF CHANNEL CATFISH (/ICTALURUS PUNCTATUS/). Trans. Am. Fish. Soc. 107 (6): 809-811. Nov. 1978. SFA 24(2)
[Dep. Fish. Allied Aquacult., Auburn Univ., Auburn, AL 36830]

79-000855 McComish, T. S.; Anderson, R. O. FROZEN CHIRONOMID LARVAE AS FOOD IN FEEDING EXPERIMENTS WITH BLUEGILLS. Proc. Indiana Acad. Sci. 87: 169-170. 1977. Abstract only. SFA 24(2)
[Dep. Biol., Ball State Univ., Muncie, IN 47306] Large quantities of chironomid larvae were collected from a sewage lagoon, cleared of debris, and frozen for use in fish feeding experiments. Bluegills (/Lepomis macrochirus/) fed frozen larvae accepted them as readily as live larvae. Changes in the proximate composition of previously frozen larvae soaked in water for 18 hours were insignificant. Size and proximate composition of larvae fluctuated seasonally. Gut contents significantly affected the proximate consumption and energy content of larvae.

79-000856 Murai, T.; Fleetwood, M. A.; Andrews, J. W. OPTIMUM LEVELS OF DIETARY CRUDE PROTEIN FOR FINGERLING AMERICAN SHAD. Prog. Fish-Cult. 41 (1): 5-6. Jan. 1979. SFA 24(2)
[Tunison Lab. Fish Nutr., Hagerman Field Stn., Hagerman, ID 83332]

79-000857 Ogino, C.; Takashima, F.; Chiou, J. Y [REQUIREMENT OF RAINBOW TROUT FOR DIETARY MAGNESIUM.] Bull. Jpn. Soc. Sci. Fish. 44 (10): 1105-1108. Oct. 1978. In Japanese with English summ. SFA 24(2)
[Lab. Fish. Nutr., Tokyo Univ. Fish., Konan 4, Minato-ku, Tokyo 108, Japan] Rainbow trout weighing 0.9g on the average were fed purified diets containing different amounts of Mg for 6 weeks. The concentration of Mg in the rearing water was 3.1 ppm. Dietary Mg levels were found to affect not only the appetite, growth, and movement of the fish but also the contents of ash, Mg, and Ca of the whole body and of the vertebrae. The occurrence of vertebral curvature was also recognized in the fish which received the Mg-deficient diet. The values for Ca/Mg of the whole body and of the vertebrae changed according to the dietary Mg levels. Histological changes were recognized in the muscle, pyloric caeca, and gill filaments from the fish fed the Mg-deficient diet. The requirement of rainbow trout for dietary Mg was estimated to be 0.06-0.07 percent of a dry diet of 12-16 mg per 1 kg body weight per day under the present experimental conditions.

79-000858 Papoutsoglou, S. E.; Papaparaskeva-Papoutsoglou, E. EFFECT OF WATER TEMPERATURE ON GROWTH RATE AND BODY COMPOSITION OF RAINBOW TROUT (/SALMO GAIRDNERI/, R) FRY, FED ON MAXIMUM RATION IN CLOSED SYSTEM. Thalassographica 2 (1): 83-97. Mar. 1978. In English with Greek summ. SFA 24(2)

[Agric. Univ. Coll., Dep. Appl. Hydrobiol., Iera, Odos, 75, Votanicos, Athens, Greece] Five populations of Rainbow trout (live weight 0.9g) were fed to satiation six times a day, six days weekly, at five different water temperatures (8 ± 0.5, 11 ± 0.5, 14 ± 0.5, 17 ± 0.5 and 20 ± 0.5°C), using 150 l tanks of recycling water system. The experimental period was 67 days, and all groups were fed the same commercial dry trout diet. As it was expected, growth rates of the investigated populations were positively correlated with water temperature. Maximum mean final body weight and highest growth rate were given by the group of 17 ± 0.5°C of water temperature. The proximate body chemical analyses, of the same group, as well as, its food conversion factor, protein efficiency ratio, total liver fat and haematocrit levels, were found to be within the established normal ranges. The present data regarding all the examined parameters are compared and discussed with related previously reported works.

79-000859 Papoutsoglou, S. E. VITAMIN AND ESSENTIAL FATTY ACID SUPPLEMENTATION IN EXPERIMENTAL DIETS FOR RAINBOW TROUT (/SALMO GAIRDNERI/, R.). Thalassographica 1 (2): 140-150. July 1977. In English with Greek summ. SFA 24(2)

[Inst. Oceanogr. Fish. Res., Athens, Greece] Four isocaloric experimental diets, each containing different amounts of vitamins and essential fatty acids, were fed to four groups of rainbow trout fry for 8 weeks. The growth rate, food conversion factor, mortality, the amounts of liver fat and glycogen, the hematocrit values and the biochemical composition of the major fractions on carcass samples - crude protein (T.N. X6.25), crude fats, ash and moisture - of these groups of fish have been determined. The use of reduced amounts of the source of essential fatty acids, as well as of the nicotinic acid, vitamin E, vitamin K(3), inositol and choline levels, in the formulation of one of the experimental tested premix, supported sufficient growth rate, protein efficiency ratio and food conversion factor. The absence of dry defatted silk-worm pupae from one diet caused the accumulation of the highest liver glycogen level and the lowest fat content, while the combination of various nutrients in one of the used premix gave the highest carcass protein level and hematocrit value. The possiblity of identifying simple to prepare, and sufficiently economical and nutritional dry trout diets, by using a proper vitamin essential fatty acid premix in natural ingredient combination has been investigated.

79-000860 Protan & Pagertun A. S. PROTANAL ALGINATES AS BINDERS IN FISH FEEDS. Riv. It. Piscic. Ittiop. 13 (4): 103-106. Oct.-Nov.-Dec. 1978. In English and Italian. SFA 24(2)

[P.O. Box 420, N-3001 Drammen, Norway]

79-000861 Rychly, J.; Spannhof, L. NITROGEN BALANCE IN TROUT. I. DIGESTIBILITY OF DIETS CONTAINING VARYING LEVELS OF PROTEIN AND CARBOHYDRATE. Aquaculture 16 (1): 39-46. Jan. 1979. SFA 24(2)

[Biol. Sect., Wilhelm-Pieck-Univ., Rostock, West Germany] The digestibility of three experimental diets of casein-gelatin basis with varying levels of carbohydrate and protein content was studied after feeding to rainbow trout. An attempt was made to estimate true protein digestibility by an indirect method, which is based on the relationship between nitrogen intake and fecal nitrogen excretion.

79-000861 CONTINUED
Both apparent and true protein digestibility were high and exceeded 97 percent in all diets. In all cases true digestibility was slightly increased compared with apparent protein digestibility. Digestibility of the whole diet decreased significantly with increasing carbohydrate and decreasing protein level in the diet.

79-000862 Sakamoto, S.; Yone, Y. IRON DEFICIENCY SYMPTOMS OF CARP. Bull. Jpn. Soc. Sci. Fish. 44 (10): 1157-1160. Oct. 1978. SFA 24(2)
[Fish. Res. Lab., Kyushu Univ., Tsuyazaki, Fukuoka, 811-33, Japan] Carp, /Cyprinus carpio/, were fed on the diets with and without supplemental iron over a 105 day period. No significant differences were recognized between the two groups in the following determinations: the growth rate, condition factor, feed efficiency, and the percentages of liver, spleen, and heart weight to body weight; the blood serum levels of total protein, total cholesterol, total bilirubin, BUN, glucose, and Ca and inorganic P; and the activities of enzymes such as GOT, GPT, ALP, LDH, and LAP in the blood serum. However, in the group fed the diet without the iron supplement, the specific gravity, Hb content, and Ht value of blood, the mean corpuscular constants, and the mean corpuscular diameter of minor length were lower, and the percentage of immature erythrocytes was higher than those of the group fed the iron-supplemented diet. These findings show that carp fed the diet without iron supplementation manifest a hypochromic microcytic anemia.

79-000863 Sakamoto, S.; Yone, Y. REQUIREMENT OF RED SEA BREAM FOR DIETARY NA AND K. J. Fac. Agric. Kyushu Univ. 23 (1/2): 79-84. Oct. 1978. SFA 24(2)
[Fish. Res. Lab., Kyushu Univ. 46-12, Tsuyazaki, Fukuoka 811-33, Japan]

79-000864 Sakamoto, S.; Yone, Y. REQUIREMENT OF RED SEA BREAM FOR DIETARY TRACE ELEMENTS. Bull. Jpn. Soc. Sci. Fish. 44 (12): 1341-1344. Dec. 1978. SFA 24(2)
[Fish. Res. Lab., Kyushu Univ., Tsuyazaki, Fukuoka, 811-33, Japan] Red sea bream, /Chrysophrys major/, were fed diets with or without supplemental trace elements (Al, Zn, Mn, Cu, Co, and I) over a 90 day period. No significant differences were detected between the two groups in the following determinations: the growth rate, feed efficiency, condition factor, and hepatosomatic index; the hemoglobin content, hematocrit value, red blood cell count, MCH, MCV, MCHC, MCD, percentage of immature erythrocytes, and number of lymphocytes and granulocytes per 1000 red blood cells in the whole blood; the blood serum levels of protein, glucose, urea-N, total bilirubin, total cholesterol, Ca, and inorganic P and Fe; the activites of GOT, GPT, ALP, LDH, and LAP in the blood serum; the lipid and glycogen content of the liver; and the lipid ash, Ca, P, Mg, and K content of the vertebrae. Furthermore, no pathological change was found in the organs of fish fed the diet without the trace element supplement. From these findings, it appears that trace element supplementation in the diet for red sea bream is not essential, when the trace elements exist at levels exceeding 0.20 mg of Al, 2.43 mg of Zn, 1.78 mg of Mn, 0.51 mg of Cu, 0.43 mg of Co, and 11.21 ug of I per 100 g diet.

79-000865 Sato, M.; Yoshinaka, R.; Yamamoto, Y.; Ikeda, S. NONESSENTIALITY OF ASCORBIC ACID IN THE DIET OF CARP. Bull. Jpn. Soc. Sci. Fish. 44 (10): 1151-1156. Oct. 1978. SFA 24(2)
[Dep. Fish., Fac. Agric., Kyoto Univ., Kyoto, Japan]

79-000866 Stott, W. T.; Sinnhuber, R. O. DIETARY PROTEIN LEVELS AND AFLATOXIN B(1) METABOLISM IN RAINBOW TROUT (/SALMO GAIRDNERI/). J. Environ. Pathol. Toxicol. 2 (2): 379-388. Nov.-Dec. 1978. SFA 24(2)
[R.O. Sinnhuber: Dep. Food. Sci. Technol., Oreg. State Univ., Corvallis 97331]

79-000867 Teng, S.-K.; Chua, T.-E.; Lim, P.-E. PRELIMINARY OBSERVATION ON THE DIETARY PROTEIN REQUIREMENT OF ESTUARY GROUPER, /EPINEPHELUS SALMOIDES/ MAXWELI, CULTURED IN FLOATING NET-CAGES. Aquaculture 15 (3): 257-271. Nov. 1978. SFA 24(2)
[Sch. Biol. Sci., Univ. Sains Malaysia, Penang, Malaysia] The dietary protein requirements of young estuary grouper, /Epinephelus salmoides/, in floating net-cages was examined. Six experimental diets of a similar calorie content (324-341 kcal/100 gm dry diet), containing protein at equally spaced concentrations between 20 and 70 percent dry diet, were tested. Sun-dried muscle from tuna (/Euthynnus affinis/) was used as the source of protein. The experiments were conducted for a period of 12 weeks and the growth response of fish to each experimental diet was calculated in terms of weight-gains, feed conversion and protein efficiency ratio. The level of dietary protein that produced the maximum weight-gain of fish was estimated from the response-curve to be at 50 percent (protein calorie to energy calorie ratio = 1:0.63). However, weight-gain of fish at 40 percent dietary protein (protein calorie to energy energy calorie ratio = 1:1.06) was not significantly different. Growth of fish was greatly depressed when they were fed on diet containing 20 or 30 percent protein. When the dietary protein is increased from 50 percent to 60 or 70 percent with protein calorie to energy ratio at 1: 0.37 or 1: 0.22, respectively, the growth of fish was not appreciably enhanced. For a given length, fish fed on diets containing 40-50 percent protein were heavier, thus more robust than those at any other diets tested. In View of these facts, the diet that contains 40 percent protein with protein calorie to energy calorie ratio at 1: 1.06 is perhaps the most economical when formulation of a practical fish feed is considered.--From abstr.

79-000868 Viola, S.; Rappaport, U. EXPERIMENTS IN NUTRITION OF CARP IN CAGES AND PONDS. III. INCREASING ENERGY DENSITY OF PELLETS BY OILS. Bamidgeh 30 (3): 67-79. Sept. 1978. SFA 24(2)
[Miloubar Ltd., M.P. Ashrat, Israel] The effects of energy supplementation of carp pellets by the addition of various oils were investigated during 3 years using carp of 200-300g grown for 5-7 weeks at high density in an array of floating cages (100 fish in 1m^3) and in 12 experimental ponds (400 fish in 200m^2). Three different kinds of acidulated soapstocks: soybean, cottonseed, and an imported mixture of plant-oil soapstock, and 3 refined oils of corresponding fatty acid composition: soybean, cottonseed and fish oil were sprayed onto basal pellets up to 9 percent. The oils or soapstocks increased the rate of growth by 20-50 percent; the acceleration was significantly correlated with increasing oil levels. Acidulated soapstocks produced the same rate of growth as their respective refined natural oils. Since feeding rates were equal (3 percent of body weight), feed conversion and protein utilization were improved correspondingly, to the growth rate.

79-000869 Watanabe, T.; Oowa, F.; Kitajima, C.; Fujita, S. [NUTRITIONAL QUALITY OF BRINE SHRIMP, /ARTEMIA SALINA/, AS A LIVING FEED FROM THE VIEWPOINT OF ESSENTIAL FATTY ACIDS FOR FISH.] Bull. Jpn. Soc. Sci. Fish. 44 (10): 1115-1121. Oct. 1978. In Japanese with English summ. SFA 24(2)
[Lab. Fish. Nutr., Tokyo Univ. Fish., Konan 4, Minato-ku, Tokyo, Japan]

79-000870 Watanabe, T.; Kitajima, C.; Arakawa, T.; Fukusho, K.; Fujita, S. [NUTRITIONAL QUALITY OF ROTIFER /BRACHIONUS PLICATILIS/ AS A LIVING FEED FROM THE VIEWPOINT OF ESSENTIAL FATTY ACIDS FOR FISH] Bull. Jpn. Soc. Sci. Fish. 44 (10): 1109-1114. Oct. 1978. In Japanese with English summ. SFA 24(2)
[Lab. Fish. Nutr., Tokyo Univ. Fish., Konan 4, Minato-ku, Tokyo, Japan]

79-000871 Watanabe, T.; Arakawa, T.; Kitajima, C.; Fukusho, K.; Fujita, S. [NUTRITIONAL QUALITY OF LIVING FEED FROM THE VIEWPOINT OF ESSENTIAL FATTY ACIDS FOR FISH.] Bull. Jpn. Soc. Sci. Fish. 44 (11): 1223-1227. Nov. 1978. In Japanese with English summ. SFA 24(2)
[Lab. Fish. Nutr., Tokyo Univ. Fish., Konan 4, Minato-ku, Tokyo, Japan]

79-000872 Yu, T. C.; Sinnhuber, R. O. EFFECT OF DIETARY OMEGA3 AND OMEGA6 FATTY ACIDS ON GROWTH AND FEED CONVERSION EFFICIENCY OF COHO SALMON (/ONCHORHYNCHUS KISUTCH/). Aquaculture 16 (1): 31-38. Jan. 1979. SFA 24(2)
[Dep. Food Sci. Technol., Oreg. State Univ., Corvallis 97331] Sixteen isocaloric diets varying only in the levels of omega3 and omega6 fatty acids were prepared. Each diet was fed to duplicate groups of coho salmon for 14 weeks. At termination, the final weight of each diet group fish was determined. The optimum level of dietary omega3 fatty acid ranged from 1 percent to 2.5 percent. Dietary omega6 fatty acid higher than 1 percent depressed fish growth. Fish growth, feed conversion efficiency, fish mortality and fatty acid composition of fish phospholipids were determined.

TRANSPORTING FISH

79-000873 McCraren, J. P.; Jones, F. M. SUGGESTED APPROACH TO COMPUTING AND REPORTING LOADING DENSITIES FOR FISH TRANSPORT UNITS. Prog. Fish-Cult. 40 (4): 169. Oct. 1978. SFA 24(2)
[U.S. FWS, Div. Natl. Fish Hatcheries, Br. Technol., Washington, DC 20240]

79-000874 Meinz, M. IMPROVED METHOD FOR COLLECTING AND TRANSPORTING YOUNG AMERICAN SHAD. Prog. Fish-Cult. 40 (4): 150-151. Oct. 1978. SFA 24(2)
[Calif. Dep. Fish Game, 1001 Jedsmith Dr., Sacramento 95819]

MISCELLANEOUS CULTURE TECHNIQUES AND EQUIPMENT

79-000875 Stine, P. A. HATCHERY ALARM SYSTEM TO PROTECT AGAINST CATASTROPHIC EGG OR FISH KILLS. Prog. Fish-Cult. 40 (4): 167-168. Oct. 1978. SFA 24(2)
[U.S. FWS, 2953 W. Indian Rd., Phoenix, AZ 85017]

GENERAL LIMNOLOGY AND OCEANOGRAPHY

79-000876 Barnes, H. , (ed.) OCEANOGRAPHY AND MARINE BIOLOGY. AN ANNUAL REVIEW. Aberdeen Univ. Press, Aberdeen, Scotland Vol. 16. 380p. 1978. Available from Aberdeen Press, Aberdeen, Scotland. SFA 24(2)
A collection of eight papers.--RS

79-000877 Neaves, P. I. LITTER FALL, EXPORT, DECOMPOSITION, AND RETENTION IN CARNATION CREEK, VANCOUVER ISLAND. Fish. Environ. Can. Fish. Mar. Serv. Tech. Rep. No. 809. vii + 45p. Sept. 1978. In English with French summ. SFA 24(2)
[Fish. Mar. Serv., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

BENTHOS

79-000878 Dufek, D. J. A LIMITED ANALYSIS OF THE BENTHOS OF FLAMING GORGE RESERVOIR 1964 TO 1966. Wyo. Game Fish Dep. Fish. Res. Rep. Monogr. Ser. No. 1. p. 31-47. July 1978. SFA 24(2)
[Wyo. Game Fish Dep., Green River] Bottom fauna data were collected at Flaming Gorge Reservoir in 1964, 1965 and 1966 from three major areas; canyon, open and inflow. Data from 1966 were most detailed; sampling in other years was restricted by equipment and time limitations. Most productive depths as indicated by number of organisms per square foot was 10 feet followed by the 25-foot and one-to-two-foot ranges. Production at the one-to-two-foot depth was limited by wave action. More organisms were generally found in the canyon area. Chironomids and amphipods were most common in the samples. All data are reported in English units following early project structure.

79-000879 Lapchin, L. MICROREPARTITION DES INVERTEBRES BENTHI$UES DANS DEUX RUISSEAUX A SALMONIDES DE BRETAGNE. [MICRODISTRIBUTION OF BENTHIC INVERTEBRATES IN TWO SALMONID STREAMS OF BRITTANY.] Ann. Hydrobiol. 8 (3): 319-332. 1977. In French with English summ. SFA 24(2)
[Cent. Rech. Hydrobiol., I.N.R.A., Lab. Ecol. Invert., B.P. 79, 64200 Biarritz, France]

79-000880 Lapchin, L.; Roux, C. UTILISATION DE L'ANALYSE DES CORRESPONDANCES POUR L'ETUDE DE LA REPARTITION DES INVERTEBRES BENTHIQUES DANS DEUX REISSEAUX A SALMONIDES DE BRETAGNE. [UTILIZATION OF CORRESPONDENCE ANALYSIS FOR THE STUDY OF BENTHIC INVERTEBRATES DISTRIBUTION IN TWO SALMONID STREAMS OF BRITTANY.] Ann. Hydrobiol. 8 (3): 333-354. 1977. In French with English summ. SFA 24(2)
[Cent. Rech. Hydrobiol., I.N.R.A., Lab. Ecol. Invert., B.P. 79, 64200 Biarritz, France]

79-000881 Momot, W. T. ANNUAL PRODUCTION AND PRODUCTION/BIOMASS RATIOS OF THE CRAYFISH, /ORCONECTES VIRILIS/, IN TWO NORTHERN ONTARIO LAKES. Trans. Am. Fish. Soc. 107 (6): 776-784. Nov. 1978. SFA 24(2)
[Dep. Biol., Lakehead Univ., Thunder Bay, ON P7B 5E1, Canada]

79-000882 Rutter, R. P.; Poe, T. P. MACROINVERTEBRATE DRIFT IN TWO ADJOINING SOUTHEASTERN PENNSYLVANIA STREAMS. Proc. Pa. Acad. Sci. 52 (1): 24-30. 1978. SFA 24(2)
[Radiation Management Corp., Pottstown Ecol. Lab., Fricks Lock Rd., Pottstown, PA 19464]

PLANKTON

79-000883 Grossnickle, N. E. THE HERBIVOROUS AND PREDACEOUS HABITS OF /MYSIS RELICTA/ IN LAKE MICHIGAN. Ph.D dissertation, Univ. Wis (Madison) 116p. 1978. From Diss. Abstr. Int. B Sci. Eng. 39(6):2662. Dec. 1978. SFA 24(2)

PRIMARY PRODUCTION

79-000884 Neitzel, D. A.; Page, T. L.; Wolf, E. G. MULTIPLE BOTTLE HOLDER FOR IN SITU MEASUREMENT OF PRIMARY PRODUCTIVITY. Prog. Fish-Cult. 41 (1): 42-43. Jan. 1979. SFA 24(2)
[Freshwater Sci. Dep., Battelle, Pac. Northwest Lab., Richland, WA 99352]

MORPHOLOGY

79-000885 Anker, G. Ch. THE MORPHOLOGY OF THE HEAD-MUSCLES OF A GENERALIZED /HAPLOCHROMIS/ SPECIES: /H. ELEGANS/ TREWAVAS 1933 (PISCES, CICHLIDAE). Neth. J. Zool. 28 (2): 234-271. June 1978. SFA 24(2)
[Zool. Lab., Kaiserstraat 63, Postbus 9516, 2300 RA Leiden, The Netherlands]

79-000886 Buynak, G. L.; Mohr, H. W., Jr. LARVAL DEVELOPMENT OF ROCK BASS FROM THE SUSQUEHANNA RIVER. Prog. Fish-Cult. 41 (1): 39-42. Jan. 1979. SFA 24(2)
[Ichthyological Assoc., Inc., R.D. 1, Berwick, PA 18603]

79-000887 Collins, B. A.; MacNichol, E. F., Jr. TRIPLE CONES FOUND IN RETINAS OF 3 FISH SPECIES. Experientia (Basel) 35 (1): 106-108. 15 Jan. 1979. SFA 24(2)
[Lab. Sens. Physiol., Mar. Biol. Lab., Woods Hole, MA 02543]

79-000888 Elshoud, G. C. A. RESPIRATION IN THE THREE-SPINED STICKLEBACK, /GASTEROSTEUS ACULEATUS/ L.; AN ELECTROMYOGRAPHIC APPROACH. Neth. J. Zool. 28 (3,4): 524-544. Sept.-Dec. 1978. SFA 24(2)
[Zool. Lab., Dep. Morphol., Rijksuniversiteit Leiden, The Netherlands]

79-000889 Fzzat, A. A.; Hashem, M. T.; El Gharabawy, M. M. BIOMETRIC VARIATIONS IN /SOLEA VULGARIS/ ACCLIMATIZED IN LAKE QUARUN, UPPER EGYPT. J. Fish Biol. 14 (1): 39-46. Jan. 1979. SFA 24(2)
[Oceanogr. Dep., Alexandria Univ., Alexandria, Egypt]

79-000890 Fahy, W. E. THE INFLUENCE OF CROWDING UPON THE TOTAL NUMBER OF VERTEBRAE DEVELOPING IN /FUNDULUS MAJALIS/ (WALBAUM). J. Cons. Cons. Int. Explor. Mer 38 (2): 252-256. Nov. 1978. SFA 24(2)
[Inst. Mar. Sci., Univ. N. C., Morehead City 28557] With epiboly one-third to one-half complete, embryos were divided into six unequal lots representing six levels of crowding (44, 66, 88, 110, 132, 154) and reared in screen-windowed containers in a fluctuating temperature regime (22.0°-26.0°C). Water space available to an individual embryo varied from a minimum of 16 ml at the start of the Experiment in the most crowded container to a maximum of 72 ml near the end of the experiment, after mortalities, in the least crowded container. Solutes did not accumulate in the containers because water moved freely through the screened window from the reservoir of the incubation chamber. Embryos at the most crowded level developed the lowest mean vertebral count that was significantly different from the three highest mean counts (66-, 88-, and 132-embryo levels). Apparently crowding causes an acceleration in metabolic rate because the more crowded embryos hatched first and these also achieved 50 percent hatching in a considerably shorter time. Further, at the most crowded level, embryos developed only 33 vertebrae in almost twice the percentage of individuals, an indication of accelerated developmental rate. It is suggested that crowding induces an interaction between acceleration of metabolism and stress that has a real influence upon the number of vertebrae developing in /F. majalis/ embryos.

79-000891 Frame, D. W.; Andrews, T. J.; Cole, C. F. OSTEOLOGY OF THE AMERICAN PLAICE, /HIPPOGLOSSOIDES PLATESSOIDES/. Postilla No. 173. 32p. 12 Apr. 1978. SFA 24(2)
[T. J. Andrews: Mass. Coop. Fish. Res. Unit, Univ. Mass., Amherst]

79-000892 Frese, J.-H. ULTRASTRUCTURE OF THE EXTRACUTANEOUS PIGMENT CELLS IN THE PLAICE (/PLEURONECTES PLATESSA/, L., TELEOSTEI). Cell Tissue Res. 195 (1): 123-144. 1978. SFA 24(2)
[Heymannstr. 5, 2000 Hamburg 20, West Germany]

79-000893 Fruge, D. J.; Truesdale, F. M. COMPARATIVE LARVAL DEVELOPMENT OF /MICROPOGON UNDULATUS/ AND /LEIOSTOMUS XANTHURUS/ (PISCES: SCIAENIDAE) FROM THE NORTHERN GULF OF MEXICO. Copeia 1978 (4): 643-648. 28 Dec. 1978. SFA 24(2)
[La. Dep. Wildl. Fish., Ferriday 71334]

79-000894 Georgi, T. A.; Beedle, D. THE HISTOLOGY OF THE EXCRETORY KIDNEY OF THE PADDLEFISH, /POLYODON SPATHULA/. J. Fish Biol. 13 (5): 587-590. Nov. 1978. SFA 24(2)
[Doane Coll., Crete, NE 68333] Kidney tissue from the freshwater chondrostean fish, /Polyodon spathula/, was examined by light microscopy. /P. spathula/ has a glomerular excretory kidney. The tubule leading from the glomerulus, based on a variety of stain reactions, is composed of two major cell types. Also based on stain reactions, it appears that ion reabsorption, hence conservation, occurs in distal portions of the tubules. Also observed were stain reactions of arteriole walls, similar to renin producing cells in other vertebrates.

79-000895 Hart, N.; Schumann, J. ORGANIZATION OF THE CORTICAL CYTOPLASM IN THE UNACTIVATED EGG OF /FUNDULUS/. Am. Zool. 18 (3): 619. 1978. Abstract only. SFA 24(2)
[Dep. Zool., Rutgers Univ., New Brunswick, NJ]

79-000896 Hubbs, C. L.; Follett, W. I. ANATOMICAL NOTES ON AN ADULT MALE OF THE DEEP-SEA OPHIDIID FISH /PARABASSOGIGAS GRANDIS/ FROM OFF CALIFORNIA. Proc. Calif. Acad. Sci. 41 (17): 389-399. 28 Dec. 1978. SFA 24(2)
[Scripps Inst. Oceanogr., La Jolla, CA 92093]

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[Res. Unit Comp. Anim. Respiration, Bristol Univ., Woodland Rd., Bristol BS8 1UG, England]

79-000898 Hulbert, W. C.; Moon, T. W. A HISTOCHEMICAL, LIGHT AND ELECTRON MICROSCOPIC EXAMINATION OF EEL, /ANGUILLA ROSTRATA/ RED AND WHITE MUSCLE. J. Fish Biol. 13 (5): 527-533. Nov. 1978. SFA 24(2)
[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

79-000899 Kemp, N. E. BANDING PATTERN AND FIBRILLOGENESIS OF CERATOTRICHIA IN SHARK FINS. J. Morphol. 154 (2): 187-204. Nov. 1977. SFA 24(2)
[Dep. Exp. Biol., Univ. Mich., Ann Arbor 48109]

79-000900 Klein, C.; Van Noorden, S. USE OF IMMUNOCYTOCHEMICAL STAINING OF SOMATOSTATIN FOR CORRELATIVE LIGHT AND ELECTRON MICROSCOPIC INVESTIGATION OF D CELLS IN THE PANCREATIC ISLET OF /XIPHOPHORUS HELLERI/ H. (TELEOSTEI). Cell Tissue Res. 194 (3): 399-404. 1978. In English with French summ. SFA 24(2)
[Lab. Zool. Embryol. Exp., 12, Rue de l'Universite, F-67000 Strasbourg, France]

79-000901 Klitgaard, T. MORPHOLOGY AND HISTOLOGY OF THE HEART OF THE AUSTRALIAN LUNGFISH, /NEOCERATODUS FORSTERI/ (KREFFT). Acta Zool. (Stockh.) 59 (3,4): 187-198. 1978. SFA 24(2)
[Inst. Comp. Anat., Univ. Copenhagen, Denmark]

79-000902 Koester, D. M.; Boord, R. L. THE CENTRAL PROJECTIONS OF FIRST ORDER ANTERIOR LATERAL LINE NEURONS OF THE CLEARNOSE SKATE, /RAJA EGLANTERIA/. Am. Zool. 18 (3): 587. 1978. Abstract only. SFA 24(2)
[Univ. Del., Newark 19711]

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[Nippon Luther Shingaku Daigaku, Mitaka-shi, Tokyo, Japan]

79-000904 Lombardi, J.; Wourms, J. P. SEM OF TROPHOTAENIAE, EMBRYONIC ADAPTATIONS IN AN OPHIDIOID, /MICROBROTULA RANDALLI/ AND OTHER VIVIPAROUS FISHES. Am. Zool. 18 (3): 607. 1978. Abstract only. SFA 24(2)
[Zool. Dep., Clemson Univ., Clemson, SC]

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[Sch. Environ. Sci., Plymouth Polytech., Plymouth, Devon, England]

79-000906 Maughan, O. E. MORPHOMETRY OF SCULPINS (/COTTUS/) IN THE CLEARWATER DRAINAGE, IDAHO. Great Basin Nat. 38 (1): 115-122. 31 Mar. 1978. SFA 24(2)
[Okla. Coop. Fish. Res. Unit, Okla. State Univ., Stillwater 74074]

79-000907 McCormick, C. A. CENTRAL PROJECTIONS OF THE LATERALIS AND EIGHTH NERVES IN THE BOWFIN, /AMIA CALVA/. Ph.D dissertation, Univ. Mich. 137p. 1978. From Diss. Abstr. Int. B Sci. Eng. 39(6):2611. Dec. 1978. SFA 24(2)

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[Seikai Reg. Fish. Res. Lab., Fish. Agency, Kokubucho, Nagasaki, Japan] In the previous paper, it was reported that a marked inflection occurs in the ratio of the upper jaw length to total length accompanying the growth of larval marine fishes. However, the meaning of the phenomenon is not explained. In the present paper, in order to

79-000924 CONTINUED
clarify the biological significance of the inflection, /Lateolabrax japonicus/ and /Pagrus major/ were selected, because morphological, physiological and ecological studies in the larval stage of these fishes are advanced. The knowledge on the formation of fin rays, development of alimentary canal, change of feeding habit etc. in the larval stage of these species were compared respectively with total length at the inflection point obtained from the relation between the upper jaw length as a percentage of total length and total length of fish. The results obtained were as follows: 1) It was noticed that the period of completion of fin rays and of digestive organs in the larval stage is shown by the total length at the inflection point. 2) The transitional period from post-larvae to juveniles could be shown by the total length at the inflection point.

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[Seikai Reg. Fish. Res. Lab., Fish. Agency, Kokubucho, Nagasaki, Japan] In the previous paper, it was concluded that the quicker the growth of fish, the greater is the mouth size at the beginning of feeding, based on the relationship between total length and size of mouth in 40 kinds of freshwater and marine fishes. However, the characteristics of the upper jaw length in the larval stage of fishes are not well known. In the present paper, in order to know the specific characteristics mentioned above, upper jaw length of 11 kinds of marine fish larvae, such as Scombridae, Carangidae, Serranidae, Sparidae, Scombresocidae and Engraulidae, were measured and the ratio of upper jaw length to total length were compared. The results obtained are as follows: 1) A marked inflection on the curve of total length-upper jaw length relationship is mainly found in the larval stage. 2) It was found that the type of curve and the total length at the inflection point are different among species.

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[Fish. Mar. Serv., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] Growth and hypoosmoregulatory ability of 'underyearling' sockeye and coho were studied in relation to the influence of constant as well as changing temperature and day length. Both environmental factors influenced growth and osmoregulatory performance. Temperature controlled the rate of response to photoperiod so that changes in growth rate caused by photoperiod treatments were apparent sooner at higher temperatures than at lower ones. Changing temperatures did not alter the final length or weight achieved in comparison with a constant temperature of the same mean. The sensitivity of the fry to photoperiod varied seasonally. The characteristics of photoperiod which formed the most important cues were direction of change and rate of change of day length. It is concluded that artificial photoperiod treatments are not required to produce 'underyearling' sockeye smolts in spring, provided that water temperatures are sufficient to allow growth to a weight of 3-4g. However, coho smoltify at a larger size and thus would require a substantially greater thermal input to produce 'underyearling' smolts in spring.

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79-000964 Coombs, S. H.; Hiby, A. R. THE DEVELOPMENT OF THE EGGS AND EARLY LARVAE OF BLUE WHITING, /MICROMESISTIUS POUTASSOU/ AND THE EFFECT OF TEMPERATURE ON DEVELOPMENT. J. Fish Biol. 14 (1): 111-123. Jan. 1979. SFA 24(2)

[Nat. Environ. Res. Council, Inst. Mar. Environ. Res., Plymouth, England] Eggs of blue whiting, /Micromesistius poutassou/ were artificially fertilised and incubated at a range of temperatures; larvae were reared for 8 1/2 days after hatching. The development of the eggs and early larvae is described and contrasted with previously published descriptions. The relationship between incubation and temperature, /t/, and development time, /d(t)/, is described by the Belehradek equation /d(t)/=a(t-a) to the b. The rate of embryonic development increased with increasing temperature, the time from fertilisation to hatching decreasing from 205 h at 6°C to 70 h at 15°C. No eggs survived to hatch at incubation temperatures above 14.5°C while at 6.2°C and below embryonic development was still proceeding when the experiment was terminated. The optimal survival rate (about 70 percent) was achieved between 6° and 10°C. Lengths of larvae at hatching were between 2.29 and 3.17 mm, those incubated at higher temperatures being at a more advanced stage of ontogenetic development. The growth rate of yolk-sac larvae declined from 10 percent per day immediately after hatching, to less than 1 percent per day 7 days later when the yolk-sac was fully absorbed. Egg diamter varied between 0.99 mm and 1.15 mm when fresh. During development eggs were initially buoyant and later sank.

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It is here theorized that zebrafish, when reared in a stressful, over-populated environment produces a pheromone(s) that lead to changes in the pituitary, thyroid, and gonadal tissues. A reduction in thyroid hormone, through hypothalamic-hypophyseal stimulation, would lead to the reported growth inhibition, since previous studies have shown that thyroxine affects growth by influencing the secretory nature of the STH cells. A reduction in thyroid hormone would affect gonadal physiology by acting directly on these organs or indirectly through an effect on the secretory nature of the GTH cells. At the present time, knowledge of the neuroendocrine mechanisms involved in stress situations, such as crowding, are inconclusive and fragmentary. The present investigation is the first attempt to study the effects of crowding in fishes through quantitative histological changes in some possible target organs.--From abstr.

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79-001101 Walzer, C.; Schonenberger, N. ULTRASTRUCTURE AND CYTOCHEMISTRY STUDY OF THE YOLK SYNCYTIAL LAYER IN THE ALEVIN OF TROUT (/SALMO FARIO TRUTTA/ L.) AFTER HATCHING. I. THE TELOVITELLOLYSIS ZONE. Cell Tissue Res. 196 (1): 59-73. 1979. SFA 24(2)
[Lab. Anat. Physiol. Comp., Univ. Geneva, Geneva, Switzerland]

79-001102 Wardle, C. S. NON-RELEASE OF LACTIC ACID FROM ANAEROBIC SWIMMING MUSCLE OF PLAICE /PLEURONECTES PLATESSA/ L.: A STRESS REACTION. J. Exp. Biol. 77: 141-155. Dec. 1978. SFA 24(2)
[Mar. Lab., P.O. Box 101, Aberdeen, Scotland]

79-001103 Wares, W. D. II; Ingram, R. OXYGEN CONSUMPTION IN THE FATHEAD MINNOW (/PIMEPHALES PROMELAS/ RAFINESQUE). I. EFFECTS OF WEIGHT, TEMPERATURE, GROUP SIZE, OXYGEN LEVEL AND OPERCULAR MOVEMENT RATE AS A FUNCTION OF TEMPERATURE. Comp. Biochem. Physiol. A Comp. Physiol. 62 (2): 351-356. 1979. SFA 24(2)
[Dr. E.H. Studier: Dep. Biol., Univ. Mich., Flint 48503] A Relationship is evident between oxygen consumption (OC in cm^3/hr) and weight (WT in g) such that: $OC = -0.580 (WT)^{1.053}$. Fathead minnows failed to exhibit immediate rate compensation as a result of acute temperature changes. Minnows showed an exponential increase in weight-specific oxygen comsumption with temperature (in °C), resulting in Q(10) of over three. The Equation is: $OC = 10^{0.0482}(Temp.) - 1.268$. Minnows acclimated to water temperatures of 5-21°C showed a steady increase in opercular movement rates (OMR) (ventilation rates) as expressed by the equation: $OMR = 0.1968 (Temp.)^2 + 1.064$. Grouping more than two fish per chamber resulted in an increase in oxygen consumption. The relationship of group size (GS) to oxygen consumption is: $OC = 0.04059(GS)^2 - 0.2017(GS) + 0.5353$. Oxygen consumption is a function of dissolved oxygen level. This relationship is shown by the equation: $OC = 0.00304^0(OL)^3 - 0.06359(OL)^2 + 0.4211(OL) - 0.4020$ where OL is oxygen level. Due to high variability, it is statistically impossible to determine oxygen level ranges in which they conformed and those in which they regulated.

79-001104 Weber, R. E.; Lykkeboe, G. RESPIRATORY ADAPTATIONS IN CARP BLOOD INFUENCES OF HYPOXIA, RED CELL ORGANIC PHOSPHATES, DIVALENT CATIONS AND CO(2) ON HEMOGLOBIN-OXYGEN AFFINITY. J. Comp. Physiol. B Biochem. Syst. Environ. Physiol. 128 (2): 127-137. 1978. SFA 24(2)
[Dep. Zoophysiol., Univ. Aarhus, DK-8000 Aarhus C, Denmark]

79-001105 Wegnez, M.; Denis, H.; Mazabraud, A.; Clerot, J.-C. BIOCHEMICAL RESEARCH ON OOGENESIS. RNA ACCUMULATION DURING OOGENESIS OF THE DOGFISH /SCYLIORHINUS CANICULUS/. Dev. Biol. 62 (1): 99-111. Jan. 1978. SFA 24(2)
[H. Denis: Cent. Genet. Molec., C.N.R.S., F-91190 Gif-sur-Yvette, Orsay, France]

79-001106 Weisbart, M.; Dickhoff, W. W.; Gorhman, A.; Idler, D. R. IDENTIFICATION OF CORTICOSTEROIDS IN THE PLASMAS OF THE SEA LAMPREY (/PETROMYZON MARINUS/) AND THE PACIFIC HAGFISH, (/EPTATRETUS STOUTI/). Am. Zool. 18 (3): 653. 1978. Abstract only. SFA 24(2)
[St. Francis Xavier Univ., Antigonish, NS, Canada]

79-001107 Weiss, R. E.; Watabe, N. ULTRASTRUCTURE OF OSTEOGENESIS AND RESORPTION IN OSTEOCYTIC AND ANOSTEOCYTIC FISH BONES. Am. Zool. 18 (3): 622. 1978. Abstract only. SFA 24(2)
[Natl. Inst. Health, Bethesda, MD]

79-001108 Wendelaar Bonga, S. E.; Greven, J. A. A. THE RELATIONSHIP BETWEEN PROLACTIN CELL ACTIVITY, ENVIRONMENTAL CALCIUM, AND PLASMA CALCIUM IN THE TELEOST /GASTEROSTEUS ACULEATUS/. OBSERVATIONS ON STANNIECTOMIZED FISH. Gen. Comp. Endocrinol. 36 (1): 90-101. Sept. 1978. SFA 24(2)
[Dep. Zool., Univ. Nijmegen, Nijmegen, The Netherlands]

79-001109 Whaley, R. A.; Maughan, O. E.; Wiley, P. H. LETHALITY OF ELECTROSHOCK TO TWO FRESHWATER FISHES. Prog. Fish-Cult. 40 (4): 161-163. Oct. 1978. SFA 24(2)
[Wyo. Game Fish Dep., Casper 82601]

79-001110 Wiegand, M. D.; Peter, R. E. EFFECTS OF SEX STERIODS ON PLASMA LIPIDS IN GOLDFISH. Am. Zool. 18 (3): 668. 1978. Abstract only. SFA 24(2)
[Dep. Zool., Univ. Alberta, Edmonton, AB, Canada]

79-001111 Wolburg, H. GROWTH AND MYELINATION OF GOLDFISH OPTIC NERVE FIBERS AFTER RETINA REGENERATION AND NERVE CRUSH. Z. Naturforsch. Sect. C Biosci. 33 (11/12): :988-996. Nov.-Dec. 1978. SFA 24(2)
[Inst. Pathol., Liebermeisterstrasse 8, D-7400, Tubingen, West Germany]

79-001112 Wyllie, M. C.; Holmstrom, E. R.; Wallace, R. K. TEMPERATURE PREFERENCE, AVOIDANCE, SHOCK, AND SWIM SPEED STUDIES WITH MARINE AND ESTUARINE ORGANISMS FROM NEW JERSEY. Ichthyol. Assoc. Inc. Bull. No. 15. iv + 76p. Aug. 1976. SFA 24(2)
[Ichthyol. Assoc., Inc., Brigantine Exp. Lab., 3201 Bayshore Ave., Brigantine, NJ 08203]

79-001113 Yabe, K.; Nakamura, K.; Suzuki, M.; Ito, Y. [THERMO-STABILITY AND OTHER PROPERTIES OF ACTOMYOSINS OF FRIGID WATER FISHES.] Bull. Jpn. Soc. Sci. Fish. 44 (12): 1345-1350. Dec. 1978. In Japanese with English summ. SFA 24(2)
[Chem. Lab., Kushiro Coll., Hokkaido Univ. Educ., Shiroyama, Kushiro 085, Japan]

79-001114 Yamanaka, H.; Nakagawasai, T.; Kikuchi, T.; Amano, K. [STUDIES ON THE CONTRACTION OF CARP MUSCLE.--I. REMARKABLE DIFFERENCES BETWEEN /RIGOR MORTIS/ AND THAW /RIGOR/.] Bull. Jpn. Soc. Sci. Fish. 44 (10): 1123-1126. Oct. 1978. In Japanese with English summ. SFA 24(2)
[Tokyo Univ. Fish., Konan 4, Minato-ku, Tokyo, Japan]

79-001115 Yano, T.; Ishio, S. STEROID HORMONE METABOLITES IN FISH URINE. III. CORTICOSTEROID METABOLITES IN CARP URINE. Bull. Jpn. Soc. Sci. Fish. 44 (12): 1405-1410. Dec. 1978. SFA 24(2)
[Lab. Fish. Chem., Fac. Agric., Kyushu Univ., Fukuoka 812, Japan]

79-001116 Yano, T.; Ishio, S. STEROID HORMONE METABOLITES IN FISH URINE. II. IDENTIFICATION OF PREGNANEDIOL, PREGNANETRIOL AND ANDROSTENEDIOL ISOLATED FROM THE URINE OF CARP. Bull. Jpn. Soc. Sci. Fish. 44 (12): 1399-1404. Dec. 1978. SFA 24(2)
[Lab. Fish. Chem., Fac. Agric., Kyushu Univ., Fukuoka 812, Japan]

79-001117 Yoshikawa, H.; Oguri, M. EFFECTS OF STEROID HORMONES ON THE SEX DIFFERENTIATION IN A CICHLID FISH, /TILAPIA ZILLII/. Bull. Jpn. Soc. Sci. Fish. 44 (10): 1093-1097. Oct. 1978. SFA 24(2)
[Fish. Lab., Fac. Agric., Nagoya Univ., Nagoya 464, Japan]

79-001118 Yoshinaka, R.; Sato, M.; Ikeda, S. /IN VITRO/ FORMATION OF COLLAGEN IN SKIN OF ASCORBIC ACID-DEFICIENT RAINBOW TROUT. Bull. Jpn. Soc. Sci. Fish. 44 (10): 1147-1150. Oct. 1978. SFA 24(2)
[Dep. Fish., Fac. Agric., Kyoto Univ., Kyoto, Japan]

79-001119 Youson, J. H.; Lee, J.; Potter, I. C. THE DISTRIBUTION OF FAT IN LARVAE, METAMORPHOSING, AND YOUNG ADULT ANADROMOUS SEA LAMPREYS, /PETROMYZON MARINUS/ L. Can. J. Zool. 57 (1): 237-246. Jan. 1979. In English with French summ. SFA 24(2)
[Dep. Zool., Scarborough Coll., Univ. Toronto, West Hill, ON M1C 1A4, Canada]

GENETICS, VARIATION STUDIES AND HYBRIDIZATION

79-001120 Avise, J. C.; Smith, M. H. GENE FREQUENCY COMPARISONS BETWEEN SUNFISH (CENTRARCHIDAE) POPULATIONS AT VARIOUS STAGES OF EVOLUTIONARY DIVERGENCE. Syst. Zool. 26 (3): 319-335. Sept. 1977. SFA 24(2)
[Dep. Zool., Univ. Ga., Athens 30602]

79-001121 Buth, D. G. CREATINE KINASE VARIABILITY IN /MOXOSTOMA MACROLEPIDOTUM/ (CYPRINIFORMES; CATOSTOMIDAE). Copeia 1979 (1): 152-154. 20 Feb. 1979. SFA 24(2)
[Dep. Biol., Univ. Calif., Los Angeles 90024]

79-001122 Dobrinskaya, L. A.; Ogurtsov, G. I.; Klimov, V. I. CHARACTERISTICS OF THE VARIATION OF THE MORPHOPHYSIOLOGICAL CHARACTERS OF A BISEXUAL POPULATION OF THE GOLDFISH. Sov. J. Ecol. (Engl. Transl. Ekologiya) 9 (2): 141-145. Mar.-Apr. 1978. SFA 24(2)
[Inst. Plant Anim. Ecol., Ural Sci. Cent., Acad. Sci., USSR]

79-001123 Fisher, S. E.; Whitt, G. S. EVOLUTION OF ISOZYME LOCI AND THEIR DIFFERENTIAL TISSUE EXPRESSION. CREATINE KINASE AS A MODEL SYSTEM. J. Mol. Evol. 12: 25-55. 1978. SFA 24(2)
[Lab. Pathol., Natl. Cancer Cent., Natl. Inst. Health, Bethesda, MD 20014] The phylogeny of the creatine kinase (CK, EC 2.7.3.2) isozyme loci and their differential tissue expressions were determined for representatives of 65 families of vertebrates, with emphasis on the fishes. The transition from the single creatine kinase locus, characteristic of certain echinoderms, to the two creatine kinase loci which are orthologous to those present in all vertebrates, occurred early in the chordate line. The majority of pre-teleostean fishes possesses only these two CK loci (A and C). These loci are relatively

79-001123 CONTINUED
generalized in their tissue expressions which are variable among species of primative fishes. The third and fourth creatine kinase loci (B and D) arose separately in the ancestors of the bony fishes and appear to be the result of regional genome duplications. Concomitant with the increase in the number of isozyme loci has been an increase in the specificity of their tissue expression. In the advanced teleost fishes the four CK loci are differentially expressed in a characteristic manner. The A(2) isozyme predominates in skeletal muscle, the B(2) isozyme in eye and brain, the C(2) isozyme in stomach muscle, and the D(2) isozyme is found exclusively in testis. We propose a phylogeny of the creatine kinase genes in the lower chordates based on the time of appearance of new CK loci, the sequence in which the loci achieve a tissue restricted expression, and the immunochemical relatedness of the orthologous and paralogous gene products.

79-001124 Gorshkova, G. V.; Gorshkov, S. A. [CHROMOSOME SETS IN SEASONAL RACES OF /ONCORHYNCHUS NERKA/ IN THE AZABACHJE LAKE (KAMCHATKA).] Zool. Zh. 57 (9): 1382-1388. Sept. 1978. In Russian with English summ. SFA 24(2)
[Inst. Cytol. Zool. Inst., USSR Acad. Sci., Leningrad, USSR]

79-001125 Guyomard, R. IDENTIFICATION PAR ELECTROPHORESE DE HYBRIDES DE SALMONIDES. [ELECTROPHORETIC IDENTIFICATION OF SALMONIDS HYBRIDS.] Ann. Genet. Sel. Anim. 10 (1): 17-27. 1978. In French with English summ. SFA 24(2)
[Lab. Physiol. Poissons, I.N.R.A., Cent. Natl. Rech. Zootech., 78350 Jouy-en-Josas, France]

79-001126 Hass, R. INTERGENETIC HYBRIDIZATION IN A SYMPATRIC PAIR OF MEXICAN CYPRINODONTID FISHES. Copeia 1979 (1): 149-152. 20 Feb. 1979. SFA 24(2)
[Dep. Biol., Calif. State Univ., Fresno 93740]

79-001127 Ojima, Y. PREPARATION OF CELL-CULTURES FOR CHROMOSOME STUDIES OF FISHES. Proc. Jpn. Acad. Ser. B Phys. Biol. Sci. 54 (3): 116-120. Mar. 1978. SFA 24(2)
[Dep. Biol., Kwansei Gakuin Univ., Nishinomiya, Japan]

79-001128 Rishi, K. K. SOMATIC G-BANDED CHROMOSOMES OF /COLISA FASCIATUS/ (PERCIFORMES: BELONTIDAE) AND CONFIRMATION OF FEMALE HETEROGAMETY. Copeia 1979 (1): 146-149. 20 Feb. 1979. SFA 24(2)
[Dep. Zool., Kurukshetra Univ., Kurukshetra 132119, India]

79-001129 Subba Rao, R.; Chandrasekaran, G. PRELIMINARY REPORT ON HYBRIDIZATION EXPERIMENTS IN TROUT--GROWTH AND SURVIVAL OF F(1) HYBRIDS. Aquaculture 15 (3): 297-300. Nov. 1978. SFA 24(2)
[Hydrobiol. Res. Stn., Ootacamund Tamilnadu, India] Hybridization experiments were carried out by crossing females of common rainbow trout with the males of albino rainbow trout. Survival rates in egg, hatchling, fry and yearling stages, and the annual growth rate were higher than those of either parent. Reciprocal crosses with females of albino rainbow trout and males of common rainbow trout showed poor survival rate. Gonadial development of these hybrids was normal.

79-001130 Swank, S. E. THE EVOLUTIONARY GENETICS OF INTERTIDAL FISH OF THE GENUS /CLINOCOTTUS/. Am. Zool. 18 (3): 634. 1978. Abstract only. SFA 24(2)
[Univ. South. Calif., Los Angeles]

79-001131 Thorpe, J. E.; Morgan, R. I. G. PARENTAL INFLUENCE ON GROWTH RATE, SMOLTING RATE AND SURVIVAL IN HATCHERY REARED JUVENILE ATLANTIC SALMON, /SALMO SALAR/. J. Fish Biol. 13 (5): 549-556. Nov. 1978. SFA 24(2)
[Freshwater Fish. Lab., Pitlochry, Perthshire PH16 5LB, Scotland]

79-001132 Ueda, T.; Ojima, Y. DIFFERENTIAL CHROMOSOMAL CHARACTERISTICS IN THE FUNA SUBSPECIES (/CARASSIUS/). Proc. Jpn. Acad. Ser. B Phys. Biol. Sci. 54 (6): 283-288. June 1978. SFA 24(2)
[Dep. Biol., Fac. Sci., Kwansei Gakuin Univ., Nishinomiya, Japan]

BEHAVIOR

79-001133 Allen, G. H.; Miyamoto, J.; Harper, W. RATE OF STRAYING IN ADULT COHO (SILVER) SALMON (/ONCORHYNCHUS KISUTCH/) FROM SMOLTS RELEASED AT AN INTERTIDAL LOCATION. Calif. Coop. Fish. Res. Unit Res. Rep. 781. ii + 44p. 1978. SFA 24(2)
[Dep. Fish., Humboldt State Univ., Arcata, CA 95521] In spring 1976, 12,000 1974-brood coho salmon (/Oncorhynchus kisutch/) smolts were planted into an intertidal estuary of a small urban stream (Jolly Giant Creek) entering north Humboldt Bay, Arcata, California. Straying was studied in the fall of 1977 by the capture of adult salmon in traps built into weirs constructed at the mouths of Jolly Giant Creek (home stream) and Jacoby Creek (adjacent stream). No salmon could pass the weir on Jolly Giant Creek, but in Jacoby Creek salmon could pass the weir during periods of high water. Escapement to Jolly Giant Creek was 0.30 percent of smolts released. An estimated 0.25 percent of the smolts released into Jolly Giant migrated to Jacoby Creek as determined from adult fish trapped at the weir and recovered by electrofishing. These data showed a rate of straying of about 45 percent as based on adults recovered in the two streams. A majority of the 3-year-old coho returning to Jacoby Creek in the fall of 1977 came from smolts released into Jolly Giant Creek. Improvement in the homing of smolts in the Jolly Giant Creek area may be improved by use of organic fractions in domestic wastewaters to be passed through two marshes and a lake to operate "imprinting ponds."

79-001134 Brandon, S. E.; Bitterman, M. E. ANALYSIS OF AUTOSHAPING IN GOLDFISH. Anim. Behav. Learn. 7 (1): 57-62. Feb. 1979. SFA 24(2)
[Univ. Hawaii, Honolulu 96822] Stimulus-reinforcer and response-reinforcer control of target-striking in goldfish were studied in a series of discrete-trials experiments. Evidence of control by adventitious response-reinforcer contiguity was provided by the first experiment, which showed less response in animals given omission training than in yoked animals with the same stimulus-reinforcer experience. In the next three experiments, evidence of control by stimulus-reinforcer contiguity apart from response-reinforcer contiguity was sought in within-subjects comparisons of omission and extinction. Only the last of these experiments, in which the CS duration was short and the ITI long, showed greater response in omission. A subsidiary finding is that autoshaped goldfish respond very little, either to the CS target or to the feeder, when target and

79-001134 CONTINUED
feeder are spatially discontiguous.

79-001135 DeVore, P. W.; White, R. J. DAYTIME RESPONSES OF BROWN TROUT (/SALMO TRUTTA/) TO COVER STIMULI IN STREAM CHANNELS. Trans. Am. Fish. Soc. 107 (6): 763-771. Nov. 1978. SFA 24(2)
[Cent. Lake Superior Environ. Stud., Univ. Wis., Superior 54880]

79-001136 Dubois, A. B.; Ogilvy, C. S. FORCES ON THE TAIL SURFACE OF SWIMMING FISH: THRUST, DRAG AND ACCELERATION IN BLUEFISH (/POMATOMUS SALTATRIX/). J. Exp. Biol. 77: 225-241. Dec. 1978. SFA 24(2)
[J.B. Pierce Found. Lab., Yale Univ., 290 Congress Ave., New Haven, CN 06519]

79-001137 Edwards, J. L. LOCOMOTOR CONVERGENCE OF ANGLER FISH AND TETRAPODS: GAIT ANALYSIS. Am. Zool. 18 (3): 611. 1978. Abstract only. SFA 24(2)
[Mich. State Univ., East Lansing]

79-001138 Ehrlich, K. F.; Hood, J. M.; Muszynski, G.; McGowen, G. E. THERMAL BEHAVIORAL RESPONSES OF SELECTED CALIFORNIA LITTORAL FISHES. NOAA Fish. Bull. 76 (4): 837-849. 1979. SFA 24(2)
[Lockheed Cent. Mar. Res., 6350 Yarrow Dr.-Suite A, Carlsbad, CA 92008] Two horizontal temperature gradients were used to measure behavioral responses to temperature of various life stages of 16 species of temperate marine fishes from southern California, and we offer guidelines for standardization of collection, acclimation, preexperimental holding, and testing conditions. We classified behavioral responses to thermal gradients using eight experimental parameters: initial, mean, modal and final selected temperatures; range of selected temperatures; skewness; kurtosis; and the degree of dispersion between individuals. We found four behavioral responses to changes in temperatures with time: 1) immediate--no general shift in selected temperature with time, 2) fast--a shift in selected temperature over the first 2 h of the experiment only, 3) slow--a shift in selected temperature over more than 2 h in the experiments, and 4) positioned--a wide range of selected temperatures and a tendency to remain in a given position in the gradient until conditions become extreme. Effects of preexperimental acclimation temperatures on thermal selection did not last longer than 4 h. One day of food deprivation resulted in lower selected temperatures and changed the precision of selection and aggregating tendencies, although the direction of the change varied between species.

79-001139 Ehrlich, K. F.; Stephens, J. S.; Muszynski, G.; Hood, J. M. THERMAL BEHAVIORAL RESPONSES OF THE SPECKIED SANDDAB, /CITHARICHTHYS STIGMAEUS/ LABORATORY AND FIELD INVESTIGATIONS. NOAA Fish. Bull. 76 (4): 867-872. 1979. SFA 24(2)
[Lockheed Cent. Mar. Res., 6350 Yarrow Dr., Suite A, Carlsbad, CA 92008]

79-001140 Emanuel, M. E.; Dodson, J. J. MODIFICATION OF THE RHEOTROPIC BEHAVIOR OF MALE RAINBOW TROUT (/SALMO GAIRDNERI/) BY OVARIAN FLUID. J. Fish. Res. Board Can. 36 (1): 63-68. Jan. 1979. In English with French summ. SFA 24(2)
[J.J. Podson: Dep. Biol., Univ. Laval, Quebec, PQ G1K 7P4, Canada]

79-001141 Freadman, M. A. HYDRODYNAMIC CORRELATES OF LOCOMOTION AND GILL VENTILATION IN STRIPED BASS AND BLUEFISH. Am. Zool. 18 (3): 594. 1978. Abstract only. SFA 24(2)
[Dep. Zool., Univ. Mass. Amherst]

79-001142 Galaktionov, G. Y. MIGRATION RATE AND SYSTEM OF SEARCH REACTIONS OF THE EUROPEAN EEL. Sov. J. Ecol. (Engl. Transl. Ekologiya) 9 (1): 88-91. Jan.-Feb. 1978. SFA 24(2)
[Atl. Sci.-Res. Inst. Fish. Oceanogr., USSR]

79-001143 Goh, Y.; Tamura, T. ELECTRICAL RESPONSES OF THE OLFACTORY TRACT TO SOME CHEMICAL STIMULANTS IN CARP. Bull. Jpn. Soc. Sci. Fish. 44 (12): 1289-1294. Dec. 1978. SFA 24(2)
[Fish. Lab., Fac. Agric., Nagoya Univ., Nagoya, Japan]

79-001144 Graf, W.; Meyer, D. L. EYE POSITIONS IN FISHES SUGGEST DIFFERENT MODES OF INTERACTION BETWEEN COMMANDS AND REFLEXES. J. Comp. Physiol. A Sens. Neural Behav. Physiol. 128 (3): 241-250. 1978. SFA 24(2)
[Dep. Histol. Neuroanat., Univ. Gottingen, D-3400 Gottingen, West Germany]

79-001145 Habib, G. INFLATION IN THE PUFFERFISH /URANOSTOMA RICHEI/ (TELEOSTEI: PLECTOGNATHI: LAGOCEPHALIDAE). Mauri Ora 5: 3-7. 1977. SFA 24(2)
[Fish. Res. Div., Minist. Agric. Fish., Wellington, New Zealand]
Inflation was investigated in samples of pufferfish /Uranostoma richei/ collected from Lyttelton Harbour, New Zealand between June 1969 and May 1970. Inflation was caused by water or air being swallowed and taken into a ventral diverticulum of the stomach, the subsequent expansion of which stretched the flexible outer skin causing the fish to assume a globular shape. There was a direct relationship between infaltion capacity (ml of water) and fish length. Fish between 48 mm and 172 mm contained from 22 ml to 360 ml of water.

79-001146 Hartwell, S. I.; Otto, R. G. SWIMMING PERFORMANCE OF JUVENILE MENHADEN (/BREVOORTIA TYRANNUS/). Trans. Am. Fish. Soc. 107 (6): 793-798. Nov. 1978. SFA 24(2)
[Chesapeake Bay Inst., Johns Hopkins Univ., Baltimore, MD 21218]

79-001147 Hawkins, A. D.; Rasmussen, K. J. THE CALLS OF GADOID FISH. J. Mar. Biol. Assoc. U.K. 58 (4): 891-911. Nov. 1978. SFA 24(2)
[Mar. Biol. Lab., Helsingor, Denmark]

79-001148 Hawkins, A. D.; Johnstone, A. D. F. THE HEARING OF THE ATLANTIC SALMON, /SALMO SALAR/. J. Fish Biol. 13 (6): 655-673. Dec. 1978. SFA 24(2)

[Mar. Lab., Aberdeen, Scotland] The hearing of the salmon, /Salmo salar/ L., was studied by means of a cardiac conditioning technique. Fish were trained to show a slowing of heart, on hearing a sound, in anticipation of a mild electric shock applied later. The minimum sound level to which the fish would respond was determined for a range of pure tones, both in the sea, and in the laboratory. The fish responded only to low frequency tones (below 380 Hz), and particle motion, rather than sound pressure, proved to be the relevant stimulus. The sensitivity of the fish to sound was not affected by the level of sea noise under natural conditions but hearing is likely to be masked by ambient noise in a turbulent river. Sound measurements made in the River Dee, near Aberdeen, lead to the conclusion that salmon are unlikely to detect sounds originating in air, but that they are sensitive to substrate borne sounds. Compared with the carp and cod the hearing of the salmon is poor, and more like that of the perch and plaice.

79-001149 Hill, B. J.; Ribbink, A. J. DEPTH EQUILIBRATION OF A SHALLOW-WATER CICHLID FISH. J. Fish Biol. 13 (6): 741-745. Dec. 1978. SFA 24(2)

[Queensland Fish., P.O. Box 36, North Quay, 4000, Australia] The cichlid /Melanochromis exasperatus/ has a natural distribution which is restricted to a single island in Lake Malawi, Africa. Diving observations indicated that it does not occur below 4.5 m depth. Measurements of depth equilibration in a pressure tank showed that males can equilibrate to a depth of 25 m and females to 18 m. Mean maximum sustained rate of depth equilibration was 2 m day^{-1}. /M. exasperatus/ survived a pressure decrease of 40 percent every 12 h from the maximum equilibration depth to the surface. The fish swim actively during the day but rest on the bottom at night when they are equilibrated to a depth 1 m deeper than ambient. Reduced activity at night is reflected in a drop in oxygen consumption to nearly half of the daytime active value.

79-001150 Holzberg, S. A FIELD AND LABORATORY STUDY OF THE BEHAVIOUR AND ECOLOGY OF /PSEUDOTROPHEUS ZEBRA/ (BOULENGER), AN ENDEMIC CICHLID OF LAKE MALAWI (PISCES; CICHLIDAE). Z. Zool. Syst. Evolutionsforsch. 16 (3): 171-187. Oct. 1978. In English with German summ. SFA 24(2)

[GSF, Inst. Biol., Abt. Strahlenbiologie Biophys., Ingolstadter Landstr. 1, D-8042, Neuherberg, West Germany]

79-001151 Jafri, A. K.; Mustafa, S.; Ahmad, I. SIZE-HIERARCHY IN A YEAR-CLASS AND "CONDITION" OF COMMON MINNOW /ESOMUS DANRICUS/ (HAM.) IN RELATION TO VARIOUS ECOLOGICAL FACTORS OPERATING IN THE POND ENVIRONMENT. Zool. J. Linn. Soc. 64 (2): 107-110. Oct. 1978. SFA 24(2)

[Sect. Ichthyol. Fish., Dep. Zool., Aligarh Muslim Univ., Aligarh-202001, U.P., India] Investigations were made on the existence of size-hierarchy in specimens of /Esomus dancrcus/ (Ham.) belonging to the same year-class, and the variations in condition factor of the different size-groups. Divergence in the growth rates of individual fish resulted in the development of size-hierarchy in the population. Marked changes seemed to occur in condition factor of the different size-groups. A multitude of factors operating simultaneously in the pond environment appeared to govern the condition factor of fish.

79-001152 Kavaliers, M. SEASONAL CHANGES IN THE CIRCADIAN PERIOD OF THE LAKE CHUB, /COUESIUS PLUMBEUS/. Can. J. Zool. 56 (12): 2591-2596. Dec. 1978. In English with French summ. SFA 24(2)
[Dep. Zool. Entomol., Colo. State Univ., Fort Collins 80523] Systematic seasonal and annual changes are present in the length of the circadian period, tau, of the lake chub, /Couesius plumbeus/. Maximum and minimum period values of 28.1 and 24.8 h were recorded under constant darkness from fish obtained at the times of the winter and summer solstices, respectively. There was an asymmetric annual pattern in the tau values obtained from the increasing and decreasing photoperiods of spring and fall. Annual variations in tau were relatively independent of temperature. They were interpreted as being aftereffects of natural photoperiodic entrainment. Relations of annual changes in the length of the period to models of circadian organization and entrainment are examined.

79-001153 Kramer, B. SPONTANEOUS DISCHARGE RHYTHMS AND SOCIAL SIGNALLING IN THE WEAKLY ELECTRIC FISH /POLLIMYRUS ISIDORI/ (CUVIER ET VALENCIENNES) (MORMYRIDAE, TELECSTEI) Behav. Ecol. Sociobiol. 4 (1): 61-74. 1978. SFA 24(2)
[Fach. Biol., Univ. Konstanz, Postfach 7733, D-7750 Konstanz, West Germany]

79-001154 Marshall, M. L.; Jahn, L. A. HOMING OF GREEN SUNFISH (/LEPOMIS CYANELLUS/) IN A WEST-CENTRAL ILLINOIS STREAM. Trans. Ill. State Acad. Sci. 70 (3/4): 323-331. 1977. SFA 24(2)

79-001155 Matthews, W. J.; Hill, L. G. INFLUENCE OF PHYSICO-CHEMICAL FACTORS ON HABITAT SELECTION BY RED SHINERS, /NOTROPIS LUTRENSIS/ (PISCES: CYPRINIDAE). Copeia 1979 (1): 70-81. 20 Feb. 1979. SFA 24(2)
[Dep. Biol., Roanoke Coll., Salem, VA 24153] Field studies were combined with single and multifactor laboratory preference tests to determine the relative influence of temperature, oxygen, pH, total dissolved solids and turbidity on red shiner habitat selection. Distribution of the species at a field site was also quantified with respect to current speed, water depth, shelter, shade and substrate type. Temperature, current speed and water depth had greatest impact on habitat selection of the species during the study. Gradients of total dissolved solids or pH can markedly influence habitat selection by red shiners; dissolved oxygen, turbidity, shelter, shade and substrate are apparently of lesser importance. Red shiners avoided temperature extremes in winter and summer, and consistently selected water deeper than 20 cm with negligible flow. They avoided highly alkaline conditions in the field, and generally selected pH of 7.1-7.4 in the laboratory. Response to total dissolved solids was strong in the laboratory, but the shiners did not respond to this factor in the field when its range was less than 500 ppm. The shiners avoided unsheltered locations and clean, unstable sand substrate. No consistent response to turbidity or shade was noted.

79-001156 Melisky, E. L.; Stauffer, J. R., Jr.; Cincotta, D. A.; Hocutt, C. H. MODIFICATIONS OF TEMPERATURE AVOIDANCE TROUGHS FOR TESTING SMALL FISHES. Prog. Fish-Cult. 41 (1): 44-45. Jan. 1979. SFA 24(2)
[Appalachian Environ. Lab., Univ. Md., Frostburg 21532]

79-001157 Mustafa, S.; Jafri, A. K. LABORATORY EXPERIMENTS ON THE SCHOOLING AND FEEDING BEHAVIOUR OF /TRICHOGASTER FASCIATUS/ (PISCES: PERCIFORMES). Zool. J. Linn. Soc. 64 (2): 103-105. Oct. 1978. SFA 24(2)
[Sect. Ichthyol. Fish., Dep. Zool., Aligarh Muslim Univ., Aligarh-202001, U.P., India] Laboratory experiments were performed on the schooling and feeding behaviour of /Trichogaster fasciatus/. There was a tendency on the part of individuals of similar size to school together; the instinct being stronger in younger specimens. Unavailability of similar-sized individuals led to schooling by members of different size-groups. Column feeding was exhibited by the fish. While feeding at the bottom, the fishes formed angles varying from 30°-90°. Larger individuals formed a right angle more often than younger members of the species. Optimum degree of crowding seemed necessary for active feeding as confinement of single individual, or overcrowded condition, both resulted in a decline of feeding activity.

79-001158 Nilsen, G. B.; Roed, K. H. A NEW AQUARIUM FOR THE STUDY OF TEMPERATURE BEHAVIOUR OF FISH. Sarsia 63 (4): 199-202. 1978. SFA 24(2)
[Norsk Inst. Vannforskning, P.B. 333, Blindern, Oslo 3, Norway] The Aquarium is based on stable vertical temperature gradients. Different sections, where temperatures can be regulated by the incoming water, are separated by partitions allowing free passage of fish between each section. Seepage of water between the sections is prevented by varying the water levels of the different sections through the outflow system. The temperature distribution in the aquarium is monitored. Testing of the stability of the system was made by adding ink to the water supply of one of the sections. The utility of the system was demonstrated on the three-spined stickleback, /Gasterosteus aculeatus/ L.

79-001159 Riemslag, F. C. C.; Schellart, N. A. M. EVOKED POTENTIALS AND SPIKE RESPONSES TO MOVING STIMULI IN THE OPTIC TECTUM OF GOLDFISH. J. comp. Physiol. A Sens. Neural Behav. Physiol. 128 (1): 13-20. 17 Nov. 1978. SFA 24(2)
[Lab. Med. Phys., Univ. Amsterdam, Amsterdam, The Netherlands]

79-001160 Scarfe, A. D. SPONTANEOUS RESPONSE OF GOLDFISH AND LEMON SHARKS TO HORIZONTAL, VERTICAL AND OBLIQUE VISUAL CONFIGURATIONS. Am. Zool. 18 (3): 651. 1978. Abstract only. SFA 24(2)
[Biol. Dep., Tex. A&M Univ., College Station]

79-001161 Slovin, M.; Rowland, W. J. THE EFFECTS OF COLOR PATTERNS ON THE AGGRESSIVE BEHAVIOR OF /TILAPIA MARIAE/ (BOULENGER). Behav. Biol. 24 (3): 378-386. Nov. 1978. SFA 24(2)
[Dep. Biol., Ind. Univ., Bloomington 47401]

79-001162 Slovin, M. I. THE EFFECTS OF VISUAL SIGNALS ON THE BEHAVIOR OF THE CICHLID FISH, /TILAPIA MARIAE/ (BOULENGER). Ph.D. dissertation, Indiana Univ. 121p. 1978. From Diss. Abstr. Int. B Sci. Eng. 39(7):3197. Jan. 1979. SFA 24(2)

79-001163 Videler, J. J.; Wardle, C. S. NEW KINEMATIC DATA FROM HIGH SPEED CINE FILM RECORDINGS OF SWIMMING COD (/GADUS MORHUA/). Neth. J. Zool. 28 (3,4): 465-484. Sept.-Dec. 1978. SFA 24(2)
[Dep. Zool., Univ. Groningen, P.O. Box 14, 9750 AA Haren, The Netherlands]

79-001164 Winkler, P. THERMAL PREFERENCE OF /GAMBUSIA AFFINIS AFFINIS/ AS DETERMINED UNDER FIELD AND LABORATORY CONDITIONS. Copeia 1979 (1): 60-64. 20 Feb. 1979. SFA 24(2)
[Coll. V.I., St. Thomas, U.S.V.I 00801] Populations of /Gambusia affinis affinis/ in the American southwest acclimatized to temperatures above, below and at 31 C have a preferred temperature of 31 C when measured in the laboratory. Individuals from one population, a high elevation lake, had never experienced temperatures above 24 C. Under field conditions, /G. a. affinis/ in a warm spring performed daily migrations from deeper to shallower water and back again in response to temperature changes in the stream. At night, no apparent thermoregulatory behavior was displayed. Marked adults in the warmest part of the spring had a mean preffered temperature of 31 C. The final preferred temperature of fish populations discussed appears to be under genetic control.

79-001165 Zyznar, E. S.; Larson, W. L.; Ali, M. A. MICROSPECTROPHOTOMETRIC STUDIES ON THE VISUAL PIGMENT IN THE INTACT RETINA OF THE GOLDFISH, /CARASSIUS AURATUS/ (LINN.). Rev. Can. Biol. 37 (3): 143-156. Sept. 1978. In English with French summ. SFA 24(2)
[Dep. Biol. Ecol. Optom., Univ. Montreal, Montreal, C.P. 6128, Suc. A, P$ H3C 3J7, Canada]

LIFE HISTORIES-GENERAL WORKS

79-001166 Adreev, V. L.; Ivankov, V. N.; Bronevskii, A. M. ECOLOGY AND MORPHOLOGICAL CHARACTERISTICS OF THE MALMA TROUT OF THE SOUTHERN KURIL ISLANDS. Sov. J. Ecol. (Engl. Transl. Ekologiya) 9 (1): 43-48. Jan.-Feb. 1978. SFA 24(2)
[Inst. Mar. Biol., Far-East Sci. Cent., Acad. Sci. USSR, Vladivostok, USSR]

79-001167 Baglin, R. E., Jr. SEX COMPOSITION, LENGTH-WEIGHT RELATIONSHIP, AND REPRODUCTION OF THE WHITE MARLIN, /TETRAPTURUS ALBIDUS/, IN THE WESTERN NORTH ATLANTIC OCEAN. NOAA Fish. Bull. 76 (4): 919-926. 1979. SFA 24(2)
[NMFS, 75 Virginia Beach Dr., Miami, FL 33149]

79-001168 Berkeley, S. A.; Houde, E. D. BIOLOGY OF TWO EXPLOITED SPECIES OF HALFBEAKS, /HEMIRAMPHUS BRASILIENSIS/ AND /H. BALAO/ FROM SOUTHEAST FLORIDA. Bull. Mar. Sci. 28 (4): 624-644. Oct. 1978. SFA 24(2)

[Rosenstiel Sch. Mar. Atmos. Sci., Univ. Miami, 4600 Rickenbacker Causeway, Miami, FL 33149] The biology and life history of two common species of halfbeaks, /Hemiramphus brasiliensis/ and /H. balao/, were investigated from January 1974 through July 1976, principally from specimens obtained by Dade County, Florida commercial fisherman. /H. brasiliensis/ constituted approximately 90 percent of the Dade County commercial catch. Age and growth, survival rate, fecundity, size at maturity, spawning seasons, food habits, and early life history were studied. Few /H. brasiliensis/ exceeded 2 years of age while /H. balao/ seldom exceeded 1 year. Both species had similar growth rates, the mean fork lengths at annulus I were 216.1 mm for /H. brasiliensis/ and 209.0 mm for /H. balao/ in 1974. The mean length of /H. brasiliensis/ in 1975 was 230.6 mm at annulus I, which was significantly longer than in 1974. The annual survival rate of /H. brasiliensis/ was 14 percent for fish between 1 and 2 years of age. Both species matured in their first year and spawned during spring and summer. Mean fecundity of /H. brasiliensis/ was 1476 while that of /H. balao/ was 4949. Larvae were well-developed at hatching and, in the laboratory, grew 1.17 mm per day for the first 27 days. Larval /H. brasiliensis/ ate zooplankton. Juvenile and adult /H. brasiliensis/ ate both seagrass and zooplankton, but /H. balao/ ate only zooplankton.

79-001169 Berns, S.; Chave, E. H.; Peters, H. M. ON THE BIOLOGY OF /TILAPIA SQUAMIPINNIS/ (GUNTHER) FROM LAKE MALAWI (TELEOSTEI: CICHLIDAE). Arch. Hydrobiol. 84 (2): 218-246. 1978. In English with French summ. SFA 24(2)

[Inst. Biol. III Univ., Lehrstuhl Zoophysiol. Abteil. Verhaltensphysiol., Beim Kupferhammer 8, D-7400, Tubingen 1, West Germany]

79-001170 Campbell, R. N. FEROX TROUT, /SALMO TRUTTA/ L., AND CHARR, /SALVELINUS ALPINUS/ (L.), IN SCOTTISH LOCHS. J. Fish Biol. 14 (1): 1-29. Jan. 1979. SFA 24(2)

[Nature Conservancy Council, Fraser Darling House, 9 Culduthel Rd., Inverness, Scotland] Although the ferox of Scottish Highland lochs (lakes) have long captured the interest of both laymen and scientists, no previous investigation of their biology or ecology has been undertaken. This paper is based on 141 ferox from 22 lochs collected during the last 22 years and the results from a recent investigation into their status and distribution. When the features of their environment and the distribution of what is apparently their main food source, the arctic charr, were investigated, two essential conditions governing the occurrence of ferox emerged and a third appeared to be important: (i) oligotrophic waters; (ii) the presence of charr and (iii) a large loch (over 100 ha in extent). Typically, ferox grow slowly during the first third of life but on reaching what may be a critical length enter into a phase of rapid growth and may eventually reach a size and age very much greater than that of the individuals in the normal trout population from which they arise. This pattern of growth contrasts markedly with that of large, fast growing brown trout from eqtrophic waters in Scotland which do not reach the same extremes of age or size.

79-001171 Chave, E. H. GENERAL ECOLOGY OF SIX SPECIES OF HAWAIIAN CARDINALFISHES. Pac. Sci. 32 (3): 245-270. July 1978. SFA 24(2)
[Curric. Res. Dev. Group, Univ. Hawaii, Honolulu 96822]

79-001172 Coon, J. C. MOVEMENT, DISTRIBUTION, ABUNDANCE AND GROWTH OF WHITE STURGEON IN THE MID-SNAKE RIVER. Ph.D. dissertation, Univ. Idaho 83p. 1978. From Diss. Abstr. Int. B Sci. Eng. 39(6):2588. Dec. 1978. SFA 24(2)
During the years 1972-75, we captured 889 white sturgeon from the Snake River between Lower Granite and Hells Canyon Dams. We tagged or tattooed all of the sturgeon and equipped 11 with sonic transmitters. We recaptured 204 of the sturgeon, one up to eight times. A significant percentage of the small sturgeon moved downstream during the study period. The observed movement averaged over 7 km per year. Most of the large sturgeon did not move far from the original site of capture. Some of the large Pools in the Snake River contained more than 200 sturgeon; 8,000-12,000 sturgeon over 0.5 m in total length resided in the study area during the period 1973-75. Small sturgeon were the most abundant (86 percent) of the fish caught. Sturgeon 1.0-2.0 m in total length were least abundant (4 percent) and large fish (over 2.0 m) comprised 10 percent of the fish caught. Growth was quite variable, but generally rapid up to 4 years of age and 60 cm in total length. From 4 to 15 years of age the growth was very slow and averaged less than 2 cm per year. After 15 years of age the sturgeon grew rapidly again for several years and then decreased as they reached lengths in excess of 2 m. Growth of sturgeon produced since dams were constructed in Hells Canyon was less than for sturgeon prouduced prior to damming of the river. Sturgeon are reproducing successfully in the middle section of the Snake River but the population may not thrive as in past years if the growth rate has indeed slowed and if critical habitat for the rearing of 1-2 meter sturgeon has been eliminated by dams in the lower Snake River.--From abstr.

79-001173 Daniels, R. A.; Moyle, P. B. BIOLOGY, DISTRIBUTION AND STATUS OF /COTTUS ASPERRIMUS/ IN THE PIT RIVER DRAINAGE, NORTHEASTERN CALIFORNIA. Copeia 1978 (4): 673-679. 28 Dec. 1978. SFA 24(2)
[Div. Wildl. Fish. Biol., Univ. Calif., Davis 95616] The Pit River and its tributary streams were surveyed from July to September 1974 to determine the range, relative abundance and certain aspects of life history of the rough sculpin, /Cottus asperrimus/. The rough sculpin was found in approximately 80 km of stream, including Pit River above and below Pit River Falls, Fall River and Hat Creek. It ranged from rare to abundant at 19 sample sites where it was collected. The life history of /C. asperrimus/ is similar to other Pacific slope freshwater sculpins. The extremely small range of this species and its rare occurrence within part of that range justify its continued status as rare.

79-001174 Fedorenko, A. Y.; Fraser, F. J. A REVIEW OF THE BIOLOGY OF GRASS CARP (/CTENOPHARYNGODON IDELLA/, VAL.) AND ITS EVALUATION AS A POTENTIAL WEED CONTROL AGENT IN BRITISH COLUMBIA. Fish. Environ. Can. Fish. Mar. Serv. Tech. Rep. No. 786. iv + 15p. Sept. 1978. In English with French summ. SFA 24(2)
[Fish. Mar. Serv., 1090 W. Pender St., Vancouver, BC V6E 2P1, Canada] The biology of grass carp (/Ctenopharyngodon idella/ Val.) is reviewed, particularly feeding habits, reproduction, behavioral activity, predators and parasites. The grass carp is tolerant of temperatures and oxygen extremes, feeds on both animal and plant material, is known to host over 80 species of parasites and can

79-001174 CONTINUED
probably reproduce successfully in North America. This fish species is a potential threat to native fish populations through competition for food and space, interference with spawning, alteration of fish habitat and spread of disease. The grass carp can also be a threat to water quality through poor assimilation of plant material. Aquatic weed species are consumed selectively and high water temperature of 20-30°C are required for intensive feeding on plants to occur. A potential serious impact of the proposed grass carp introduction into British Columbia is expected because of substantial differences existing between the biological and physical parameters of the B.C. Okanagan Basin Lakes and those of the grass carp's natural habitat. Consequently, the authors and the Interagency Transplant Committee conclude that the proposed introduction is highly undesirable and should not be considered.

79-001175 Galbreath, J. COLUMBIA RIVER COLOSSUS THE WHITE STURGEON. Oreg. Wildl. 34 (3): 3-8. Mar. 1979. SFA 24(2)
[Oreg. Dep. Fish. Wildl., P.O. Box 3503, Portland 97208]

79-001176 Graham, K.; Bonislawsky, P. AN INDEXED BIBLIOGRAPHY OF THE PADDLEFISH (/POLYODON SPATHULA/). Mo. Dep. Conserv., Columbia 12p. 1978. SFA 24(2)
[Mo. Dep. Conserv., 1110 College Ave., Columbia 65201] Three-hundred thirty-five references were listed alphabetically, numbered, and cross-indexed into one or more of the 16 subject headings. Pertinent subject heading code numbers follow each reference. In addition, the 16 subject headings are listed, followed by the appropriate reference code number. Information regarding the Chinese paddlefish (/Psephurus gladius/) was included in the literature search because of systematic affinities between it and the North American Paddlefish (/Polyodon spathula/).

79-001177 Guillory, V. LIFE HISTORY OF CHAIN PICKEREL IN A CENTRAL FLORIDA LAKE. Fla. Game Fresh Water Fish. Comm. Fish. Bull. No. 8. 75p. undated. SFA 24(2)
[Fla. Game Fresh Water Fish Comm., Tallahassee 32304]

79-001178 Lewis, M. A. NOTES ON THE NATURAL HISTORY OF THE LONGFIN DACE, /AGOSIA CHRYSOGASTER/, IN A DESERT RHEOCRENE. Copeia 1978 (4): 703-705. 28 Dec. 1978. SFA 24(2)
[Environ. Sfaety Dep., Ivorydale Tech. Cent., Procter and Gamble, Cincinnati, OH 45217]

79-001179 Luling, K. H. WISSENSCHAFTLICHE ERGEBNISSE DES FORSCHUNGSAUFENTHALTES DR. K. H. LULING IN ARGENTINA 1975: UEBER DEN BIOTOP DES PATAGONISCHEN MESSINGSALMLERS /GYMNOCHARACINUS BERGII/ (PISCES, CHARACIDAE). [RESULTS OF DR. K. H. LULINGS RESEARCH IN ARGENTINA IN 1975: ABOUT THE BIOTOPE OF THE PATAGONIAN /GYMNOCHARACINUS BERGII/ (PISCES, CHARACIDAE).] Zool. Anz. 201 (5/6): 410-423. 1978. In German with Pnglish summ. SFA 24(2)
[Mus. Alexander Koenig, Adenauerallee 150-164, D-5300 Bonn, West Germany]

79-001180 Manooch, C. S. III; Nakamura, E. L.; Hall, A. B. ANNOTATED BIBLIOGRAPHY OF FOUR ATLANTIC SCOMBRIDS: /SCOMBEROMORUS BRASILIENSIS/, /S. CAVALLA/, /S. MACULATUS/, AND /S. REGALIS/. NOAA Tech. Rep. NMFS Circ. 418. iii + 166p. Dec. 1978. SFA 24(2)
[NMFS, Beaufort, NC 28516] Annotated references are presented on 570 papers published from 1793-1977 on /Scomberomorus brasiliensis/, serra Spanish mackerel; /S. cavalla/, king mackerel; /S. maculatus/, Spanish mackerel; and /S. regalis/, cero. A subject index is included for each species and covers a variety of topics ranging from taxonomy to commerical and recreational fishing.

79-001181 Miller, R. R. ECOLOGY, HABITS AND RELATIONSHIPS OF THE MIDDLE AMERICAN CUATRO OJOS, /ANABLEPS DOWNI/ (PISCES: ANABLEPIDAE). Copeia 1979 (1): 82-91. 20 Feb. 1979. SFA 24(2)
[Mus. Zool., Univ. Mich., Ann arbor 48109] The distinctive traits of the three species of the viviparous cyprinodontoid Anablepidae are described. These fishes are probably more closely related to the Poeciliidae than to the Jenynsiidae, although the phylogenetic sequence of the five New World cyprinodontoid families remains to be determined. The occurrence of "sexual rights and lefts", with the implication that a "left handed" male can only mate with a "right handed" female, needs study of live, reproducing fish to determine the functional significance of this feature. The distribution, ecology, habits and relationships of /Anableps dowi/, the northernmost and only Pacific representative, are discussed. In comparison with its two northern South American relatives, /A. dowi/, the largest of the three, has fewer vertebrae, an intermediate scale number and a simpler color pattern, and is judged to be closest to the common ancestral stock. It is also predominantly fluvial in habitat, penetrating far inland, whereas the two southern species are coastal and lowland, not moving inland very far beyond tidal influence. /Anableps dowi/ occurs in schools of 10 to perhaps 200 (most of these of one age-group), with large adults occurring singly, in pairs or small groups. It is insectivorous and, at night, enters very shallow water to forage for insects and other invertebrates. When threatened with capture by a seine, males seemed to be more inclined to submerge, whereas females (which are larger than males) escaped by jumping over the cork line. The wide establishment of /A. dowi/ in fresh water may be related to the depauperate freshwater fish fauna of Middle America. This species has 2n = 46 chromosomes that are either acrocentric or subtelocentric.

79-001182 Page, L. M. REDESCRIPTION, DISTPIBUTION, VARIATION AND LIFE HISTORY NOTES ON /PERCINA MACROCEPHALA/ (PERCIDAE). Copeia 1978 (4): 655-664. 28 Dec. 1978. SFA 24(2)
[Ill. Nat. Hist. Surv., Urbana 61801] /Percina macrocephala/ occupies swift streams from New York to Tennessee. Although sporadically distributed and rare over most of its range the species can be captured regularly in a few rivers. The species is redescribed and contrasted with closest relatives. /P. macrocephala/ in the upper Ohio River system is morphologically intermediate to those populations of /P. macrocephala/ in the Green and upper Tennessee River Systems. /P. macrocephala/ in the Cumberland and Duck rivers is most similar morphologically to the Green River population. Life history data on Green River specimens indicate that the species spawns in spring, lives a maximum of three or four years and feeds (at 71-94 mm SL) on crayfishes and mayflies.

79-001183 Rombough, P. J.; Barbour, S. E.; Kerekes, J. J. LIFE HISTORY AND TAXONOMIC STATUS OF AN ISOLATED POPULATION OF ARCTIC CHAR, /SALVELINUS ALPINUS/, FROM GROS MORNE NATIONAL PARK, NEWFOUNDLAND. J. Fish. Res. Board Can. 35 (12): 1537-1541. Dec. 1978. In English with French summ. SFA 24(2)
[Biol. Dep., Dalhousie Univ., Halifax, NS B3H 4J1, Canada]

79-001184 Tsunikova, E. P. ECOLOGICAL CHARACTERISTICS OF THE LIMAN PERIOD OF LIFE OF THE TARAN, /RUTILUS RUTILUS HECKELI/. Sov. J. Ecol. (Engl. Transl. Ekologiya) 9 (1): 84-88. Jan.-Feb. 1978. SFA 24(2)
[Azov Sci. Res. Inst. Fish., USSR]

79-001185 Wenner, C. A. NOTES ON FISHES OF THE GENUS /PARALIPARIS/ (CYCLOPTERIDAE) ON THE MIDDLE ATLANTIC CONTINENTAL SLOPE. Copeia 1979 (1): 145-146. 20 Feb. 1979. SFA 24(2)
[S.C. Mar. Resour. Res. Inst., P.O. Box 12559, Charleston 29412]

79-001186 Willoughby, N. G.; Tweddle, D. THE ECOLOGY OF THE CATFISH /CLARIAS GARIEPINUS/ AND /CLARIAS NGAMENSIS/ IN THE SHIRE VALLEY, MALAWI. J. Zool. (Lond.) 186 (4): 507-534. Dec. 1978. SFA 24(2)
[Fish. Dep., P.O. Box 593, Lilongwe, Malawi]

POPULATION STUDIES, PRODUCTION, ETC.

79-001187 Bagliniere, J. L.; Fontenelle, G. LES POPULATIONS DE SAUMON ATLANTIQUE (/SALMO SALAR/, L. 1766) EN BRETAGNE ET BASSE-NORMANDIE. 3.--RECAPTURES DE SAUMONS ADULTES MARQUES AU STADE SMOLT PAR ABLATION DE LA NAGEOIRE ADIPEUSE. [THE POPULATIONS OF /SALMO SALAR/ L., 1766 IN BRITTANY AND LOWER NORMANDY. 3.--RECAPTURES OF ADULT SALMONS MARKED AS SMOLTS BY CLIPPING THE ADIPOSE FIN.] Ann. Hydrobiol. 8 (3): 401-411. 1977. In French with English summ. SFA 24(2)
[Lab. Ecol. Hydrobiol., I.N.P.A.-E.N.S.A., Cent. Rech. Rennes, 65, rue de Saint-Brieuc, 35042 Rennes Cedex, France]

79-001188 Dommasnes, A.; Monstad, T.; Nakken, O. ICDDEUNDERSOKELSER I BARENTSHAVET I JUNI OG JULI 1977. [CAPELIN INVESTIGATIONS IN THE BARENTS SEA IN JUNE AND JULY 1977.] Fisken Havet 1978 (2): 23-40. 1978. In Norwegian with English summ. SFA 24(2)
[Fiskeridirektoratets Havforskningsinstitutt, Bergen, Norway]

79-001189 Gibson, R. J. RECENT CHANGES IN THE POPULATION OF JUVENILE ATLANTIC SALMON IN THE MATAMEK RIVER, QUEBEC, CANADA. J. Cons. Cons. Int. Explor. Mer 38 (2): 201-207. Nov. 1978. SFA 24(2)
[Woods Hole Oceanogr. Inst., Woods Hole, MA 02543] Investigations have been conducted on Atlantic Salmon in the Matamek River since 1967. Numbers of juveniles have decreased in recent years and their growth has increased. Two year old smolt were not found in 1967, but in 1976 made up 20 percent of the run. The majority continue to migrate at three years old. The ratio of male to female smolt in 1967 was about 1:1, but in 1976 was about 1:3. The proportion of precocious male parr appears to have increased. The habitat has remained unchanged, and the fish are unexploited except for controlled scientific sampling. The changes are probably due to a reduced egg deposition. The ratio of two-sea-year salmon: grilse has decreased

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from 1:1.1 to 1:4.5 and the number of two-sea-year salmon appears to have decreased.

79-001190 Goshima, S.; Yamaoka, K.; Nagano, M.; Enami, S. [SEASONAL FLUCTUATION IN NUMBER AND BIOLOGICAL PRODUCTION OF THE TWO GOBIOID FISHES IN LAKE IKEDA.] Jpn. J. Ecol. 28 (4): 357-366. Dec. 1978. In Japanese with English summ. SFA 24(2)
[Fac. Fish., Kagoshima Univ., Kagoshima 890, Japan] The study is aimed to stress the importance of littoral region in the lake for the two gobioid fishes (/Tridentiger obscurus/ and /Rhinogobius giurinus/) from the view point of biological production. Seasonal changes in density and mean body weight were estimated by monthly sampling. Both species showed seasonal migrations in the lake; in spring they immigrated from offshore to littoral region for spawning and feeding, while in winter they emigrated for overwintering from littoral region to offshore. Production rates of both fishes were estimated by Allen's method in each of the littoral region and offshore, and the significance of littoral region for production of both species was discussed in relation to their seasonal migrations.

79-001191 Marsh, B. SPECIES RICHNESS AND ABUNDANCE OF CLINID FISH (TELEOSTEI: CLINIDAE) IN INTERTIDAL ROCK POOLS. Zool. Afr. 13 (2): 283-291. 1978. SFA 24(2)
[Zool. Dep., Univ. Cape Town, South Africa]

79-001192 Milner, N. J.; Gee, A. S.; Hemsworth, R. J. THE PRODUCTION OF BROWN TROUT, /SALMO TRUTTA/ IN TRIBUTARIES OF THE UPPER WYE, WALES. J. Fish Biol. 13 (5): 549-612. Nov. 1978. SFA 24(2)
[Univ. Wales Inst. Sci. Technol., Field Cent., Newbridge-on-Wye, Powys, Wales] The population density, age structure, biomass, growth and production of brown trout were investigated in four tributaries of the upper River Wye. The populations at each site were largely maintained by immigration from nursery areas. Abundance of separate year classes at sites on the three largest tributaries reached a peak at age 2+. On the smallest stream numbers reached a peak at 1+. Recruitment occurred throughout the year but decreased with age of year classes. Maximum 0+ densities ranged from 0.04 to 0.89 m^{-2} and greater than 0+ densities from 0.13 to 0.59 m^{-2}. Averge total biomass in 1975 ranged from 2.6 to 14.2 g m^{-2}. Within the study sites annual trout production in 1975 ranged from 2.9-19.7 g m^{-2}. Production values were dependent on age structure and population mobility at the study sites. In the three largest streams 2+ and 3+ fish contributed 66.3-88.3 percent of total production whilst 1+ and 2+ fish contributed 74.5-84.5 percent of the total in the smallest stream. The mobile (non-resident) component of the population accounted for up to 60-70 percent of production at certain times of the year, but over the year (1976) accounted for about 30 percent of total production. The resident component of the highest annual production value (19.7 g m^{-2}) was estimated to be between 15.0 and 18.2 g m^{-2}.

79-001193 Montolio, M. A.; Juarez, M. ESTIMADO PRELIMINAR DE LA POBLACION EN DESOVE DEL BONITO (/KATSUWONUS PELAMIS/ LIN., 1758) EN EL CARIBE OCCIDENTAL. [ASSESSMENTS OF THE SPAWNING STOCK OF BONITO (/KATSUWONUS PELAMIS/ LIN., 1758) IN THE WESTERN CARIBBEAN.] Rev. Invest. 2 (3): 267-276. 1976. In Spanish and French with English summ. SFA 24(2)
[Cent. Invest. Pesq., Havana, Cuba] This paper presents the assessments of the spawning stock of /Katsuwonus pelamis/ (Bonito, Listado, Skipjack, Barrilete, etc.) in the Western Caribbean Sea based

79-001193 CONTINUED
in the relationship between the larvae abundance and the spawning stock. The estimates of mortality and daily survival during the larvae development are given and also the conclusions that the spawning biomass is of 69,000 M.T. This paper also shows that the Caribbean Sea is an important spawning area for this species, in the western Atlantic.

79-001194 Stanley, C. A. AREA OF DISTRIBUTION, MOVEMENTS, AGE COMPOSITION AND MORTALITY RATES OF THE AUSTRALIAN SALMON POPULATION IN TASMANIA, VICTORIA AND NEW SOUTH WALES. Aust. J. Mar. Freshwater Res. 29 (4): 417-433. Aug. 1978. SFA 24(2)
[Div. Fish. Oceanogr., CSIRO, P.O. Box 21, Cronulla, N.S.W. 2230, Australia]

79-001195 Ulltang, O. METHODS OF MEASURING STOCK ABUNDANCE OTHER THAN BY THE USE OF COMMERCIAL CATCH AND EFFORT DATA. FAO Fish. Tech. Pap. No. 176. vii + 23p. Sept. 1977. SFA 24(2)
[Inst. Mar. Res., Bergen, Norway]

79-001196 Van Winkle, W.; Kirk, B. L.; Rust, B. W. PERIODICITIES IN ATLANTIC COAST STRIPED BASS (/MORONE SAXATILIS/) COMMERCIAL FISHERIES DATA. J. Fish. Res. Board Can. 36 (1): 54-62. Jan. 1979. In English with French summ. SFA 24(2)
[Environ. Sci. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830]

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC.

79-001197 Arnold, C. R.; Wakeman, J. M.; Williams, T. D.; Treece, G. D. SPAWNING OF RED SNAPPER (/LUTJANUS CAMPECHANUS/) IN CAPTIVITY. Aquaculture 15 (3): 301-302. Nov. 1978. SFA 24(2)
[Univ. Tex., Port Aransas Mar. Lab., Port Aransas 78373] Red snapper (/Lutjanus campechanus/) spawned in captivity when held at temperatures and photoperiods which approximated normal conditions in the Texas Gulf of Mexico region. Multiple Spawns were observed in May and June, 1978.

79-001198 Auty, E. H. REPRODUCTIVE BEHAVIOUR AND EARLY DEVELOPMENT OF THE EMPIRE FISH /HYPSELEOTRIS COMPRESSUS/ (ELEOTRIDAE). Aust. J. Mar. Freshwater Res. 29 (5): 585-597. Oct. 1978. SFA 24(2)
[New South Wales State Fish., 211 Kent St., Sydney, N.S.W. 2000, Australia] /H. compressus/ is a small Australian freshwater eleotrid which is sexually dimorphic. The colourful male is involved in aggressive and courtship displays throughout a protracted breeding season and also guards the eggs during their short development. The female is capable of spawning repeatedly throughout the breeding season and it is estimated that she may produce at least 40,000 eggs per season. The eggs are very small, being approximately 0.32 mm on the longest axis, and are transparent and adhesive. Hatching usually occurs between 10 and 14 h after fertilization. The newly hatched prolarvae are poorly developed, without rayed fins or an alimentary tract. Their development was observed for 10 days by which time the yolk had been lost but no larvae survived beyond this point.

79-001199 Brown, D. H.; Marshall, J. A. REPRODUCTIVE BEHAVIOUR OF THE RAINBOW CICHLID, /HEROTILAPIA MULTISPINOSA/ (PISCES, CICHLIDAE). Behaviour 67 (3,4): 299-321. 1978. In English with German summ. SFA 24(2)

[Dep. Biol., W.Va. Univ., Morgantown] Specific patterns and colour changes were associated with the non-reproductive prespawining, spawning, and parental phases of the reproductive cycle of /Herotilapia multispinosa/. The motor patterns involved with reproductive behaviour were characteristic of those patterns previously described for cichlids. the duration of spawning, number of eggs/spawning, and time required for eggs to hatch also conformed to previous works on substrate spawning cichlids. Spawning was not randomly distributed throughout the day but showed a peak of activity during the sixth hour of light. Constant light disrupted and inhibited spawning activities. /H. multispinosa/ exhibit a division of labour between the male and female, the female caring for the young more than the male. Finally, /H. multispinosa/ produce four sounds during the reproductive cycle. Two sounds, the "volley" and "thump", were associated with agonistic behaviour while one sound, the "growl" was associated with the synchronization of the breeding pair with respect to spawning. The last sound, the "whoof", could not be linked to a particular behavioural state since it was produced too infrequently. All four sounds showed physical properties that would indicate that they were produced by a swimbladder mechanism. No periodicity of sound production was observed.

79-001200 Colin, P. L.; Clavijo, I. E. MASS SPAWNING BY THE SPOTTED GOATFISH, /PSEUDUPENEUS MACULATUS/ (BLOCH) (PISCES: MULLIDAE). Bull. Mar. Sci. 28 (4): 780-782. Oct. 1978. SFA 24(2)

[Dep. Mar. Sci., Univ. Puerto Rico, Mayaguez 00708] A group of 300-400 /Pseudupeneus maculatus/ (Bloch), the spotted goatfish, was observed engaged in mass spawning during the afternoons of 3-4 March 1977 at Reef Bay, St. Johns, U.S. Virgin Islands. Eggs and sperm were released at the top of a short spawning rush over a sandy bottom adjacent to a coral reef. The site was near to a spawning area of the yellowtail parrotfish, /Sparisoma rubripinne/ (Cuv. and Val.) and is the most seaward extension of the reef. This location may represent a "superior" spawning site for reef fishes with planktonic eggs. The short spawning rush of this species may be influenced by distance to available shelter.

79-001201 Colton, J. B., Jr.; Smith, W. G.; Kendall, A. W., Jr.; Berrien, P. L.; Fahay, M. P. PRINCIPAL SPAWNING AREAS AND TIMES OF MARINE FISHES, CAPE SABLE TO CAPE HATTERAS. NOAA Fish. Bull. 76 (4): 911-915. 1979. SFA 24(2)

[NMFS, Narragansett, RI 02882]

79-001202 Emery, L.; Brown, E. H., Jr. FECUNDITY OF THE BLOATER (/COREGONUS HOYI/) IN LAKE MICHIGAN. Trans. Am. Fish. Soc. 107 (6): 785-789. Nov. 1978. SFA 24(2)

[U.S. FWS, 3990 East Broad, Columbus, OH 43215]

79-001203 Jakobsen, T. SKREIINNSIGET I LOFOTEN I 1977. [THE SPAWNING MIGRATION OF ARCTIC COD IN LOFOTEN IN 1977.] Fisken Havet 1978 (1): 9-19. 1978. In Norwegian with English summ. SFA 24(2)
[Fiskeridirektoratets Havforskningsinstitutt, Bergen, Norway]

79-001204 Jakobsen, T. SKREIINNSIGET I LOFOTEN I 1976. [THE SPAWNING MIGRATION OF ARCTIC COD IN LOFOTEN IN 1976.] Fisken Havet 1978 (1): 1-8. 1978. In Norwegian with English summ. SFA 24(2)
[Fiskeridirektoratets Havforskningsinstitutt, Bergen, Norway]

79-001205 Kennedy, J. L.; Kucera, P. A. THE REPRODUCTIVE ECOLOGY OF THE TAHOE SUCKER, /CATOSTOMUS TAHOENSIS/, IN PYRAMID LAKE, NEVADA. Great Basin Nat. 38 (2): 181-186. 30 June 1978. SFA 24(2)
[W.F. Sigler & Assoc. Inc., 1005 Terminal Way, Suite 155, Reno, NV 89502] The Tahoe sucker spawns in Pyramid Lake from April to August at lake temperatures of 11.7 to 22.7 C. The spawning population is comprised of a large lake spawning group and a numerically smaller river running group. The river running group is smaller in length and was not considered during this study. The sex ratio of sampled suckers significantly favored the females. This is the result of the longer life of females and greater mortality of males during spawning. Pyramid Lake Tahoe suckers reach sexual maturity at two to three years of age; however, those in Lake Tahoe do not mature until four or five years of age. the size at sexual maturity is different in both populations, which suggests that size or rate of growth rather than age determines sexual maturity. The fecundity of Tahoe suckers is positively correlated with fork length, weight, and age. Additional analysis showed that a better correlation occurred between fish size (either length or net weight) and total ovary weight. We believe that fish size is primarily correlated with total reproductive tissue produced and secondarily with fecundity. A comparison of the Pyramid Lake population and the Lake Tahoe population demonstrated that size, not age, is the most important determinant of Tahoe sucker fecundity.

79-001206 Kucera, P. A. REPRODUCTIVE BIOLOGY OF THE TUI CHUB, /GILA BICOLOR/, IN PYRAMID LAKE, NEVADA. Great Basin Nat. 38 (2): 203-207. 30 June 1978. SFA 24(2)
[W.F. Sigler & Assoc. Inc., 1005 Terminal Way, Suite 155, Reno, NV 89502] Sex ratios for tui chubs (/Gila bicolor/), obtained from a sample of 3,384 fish, deviated significantly from the expected 1:1 ratio (chi-square, P less than 0.05). Spawning occurred from June to August, with estimated fecundities ranging from 6,110 to 68,933 ova. Females spawned after attaining a maximum (average) gonadal somatic index (GSI-percent gonad weight/total body weight) of 9.1 percent and between surface water temperatures of 15.5 to 22.2 C. Males reached sexual maturity at age two, with most females maturing at age three. Consistent increases in fecundity were apparent with increasing length, weight, and age. Linear regressions between fork length and fecundity and weight and fecundity were highly significant (P less than 0.05).

79-001207 Kynard, B. E. BREEDING BEHAVIOR OF A LACUSTRINE POPULATION OF THREESPINE STICKLEBACKS (/GASTEROSTEUS ACULEATUS/ L.). Behaviour 67 (3,4): 178-207. 1978. In English with French summ. SFA 24(2)
[Mass. Coop. Fish. Res. Unit, Univ. Mass., Amherst 01003]

79-001208 Kynard, B. E. NEST DESERTION OF MALE /GASTEROSTEUS ACULEATUS/. Copeia 1978 (4): 702-703. 28 Dec. 1978. SFA 24(2)
[Sch. Renewable Nat. Resour., Univ. Ariz., Tucson 85721]

79-001209 Lenanton, R. C. J. AGE, SPAWNING TIME AND FECUNDITY OF AUSTRALIAN HERRING (/ARRIPIS GEORGIANUS/ C. & V.) (PISCES: ARRIPIDAE) FROM THE WATERS AROUND ROTTNEST ISLAND, WESTERN AUSTRALIA. Aust. J. Mar. Freshwater Res. 29 (5): 599-612. Oct. 1978. SFA 24(2)
[West. Australian Mar. Res. Lab., P.O. Box 20, North Beach, Western Australia 6020] Scales and ovarian material were examined from Australian herring taken from the amateur line fishery in waters off Rottnest Island, W.A., over the period 28 March to 23 June 1973. The age-length distributions of a number of samples of both males and females are presented. Those fish sampled were predominatly 3+ years old. Resting or undeveloped ova were translucent and less than 0.1 mm in diameter. Developing ova were opaque and greater than 0.1 mm in diamter. Mature or ripe ova were translucent, slightly elliptical, unpigmented with a central oil globule, and were between 0.6 and 1.1 mm in diameter. Spawning was deduced to have occurred during early June. Most fish taken during the 1973 amateur fishery were in an immediate prespawning condition. Only one of the 516 females examined had ovaries containing ripe ova. The equation $F=298L^{1.924}$ describes the relationship between estimated fecundity (F) and fish length (L).

79-001210 Lobel, P. S. DIEL, LUNAR, AND SEASONAL PERIODICITY IN THE REPRODUCTIVE BEHAVIOR OF THE POMACANTHID FISH, /CENTROPYGE POTTERI/, AND SOME OTHER REEF FISHES IN HAWAII. Pac. Sci. 32 (2): 193-207. Apr. 1978. SFA 24(2)
[Mus. Comp. Zool., Harvard Univ., Cambridge, MA 02138]

79-001211 May, R. C.; Akiyama, G. S.; Santerre, M. T. LUNAR SPAWNING OF THE THREADFIN, /POLYDACTYLUS SEXFILIS/, IN HAWAII. NOAA Fish. Bull. 76 (4): 900-904. 1979. SFA 24(1)
[Asian Dev. Bank, P.O. Box 789, Manila, Philippines]

79-001212 Perrone, M. THE ECONOMY OF BROOD DEFENCE BY PARENTAL CICHLID FISHES, /CICHLASOMA MACULICAUDA/. Oikos 31 (1): 137-141. 1978. In English with Russian summ. SFA 24(2)
[Dep. Zool., Univ. Wash., Seattle] Brood defense by parental cichlid fish, /Chichlasoma maculicauda/ Regan, was observed in Gatun Lake, Panama. Both parents guard the nest and the school of swimming fry by attacking intruders. Parents keep potential egg predators away from the nest, but allow nonpredators to approach it. Parents chase fry predators when these predators approach to the distance from the brood at which they usually attack it. When parents are experimentally removed from their brood, the fry join nearby family schools and the foster parents eat the foreign fry or chase them away. Families are spaced, through fights between adjacent pairs, so that fry are too far from nearby families to be attracted to them.

79-001213 Schlueter, R. A. REPRODUCTION OF /NOTROPIS SPILOPTERUS/ AND /PIMEPHALES VIGILAX/ IN THE LOWER WHITE RIVER, PIKE COUNTY, INDIANA. Proc. Indiana Acad. Sci. 87: 430. 1977. Abstract only. SFA 24(2)
[Div. Sci. Math., Univ. Tampa, Tampa, FL] Gonads of /Notropis spilopterus/ develop from March to June and become ripe in June. Spawning peak occurs in late July and August. Females contained eggs of three different size groups in addition to large ripe eggs indicating fractional spawning. Gonads of /Pimephales vigilax/ develop in April and May and become ripe in June and July. Spawning occurs in June and early July. Ripe females had two egg sizes. Males were larger than females.

79-001214 Silverman, H. I. THE EFFECTS OF VISUAL SOCIAL STIMULATION UPON AGE AT FIRST SPAWNING IN THE MOUTH-BROODING CICHLID FISH /SAROTHERODON (TILAPIA) MOSSAMBICUS/ (PETERS). Anim. Behav. 26 (4): 1120-1125. Nov. 1978. SFA 24(2)
[1855 East 8th St., No. 15, Davis, CA 95616]

79-001215 Silverman, H. I. EFFECTS OF DIFFERENT LEVELS OF SENSORY CONTACT UPON REPRODUCTIVE ACTIVITY OF ADULT MALE AND FEMALE /SAROTHERODON/ (TILAPIA) MOSSAMBICUS/ (PETERS); PISCES: CICHLIDAE. Anim. Behav. 26 (4): 1081-1090. Nov. 1978. SFA 24(2)
[1855 East th St., No. 15, Davis, CA 95616]

79-001216 Skreslet, S.; Danes, G. J. SEAWARD TRANSPORT OF EGGS OF COASTAL COD (/GADUS MORHUA/) FROM SPAWNING GROUNDS IN ULLSFJORD, NORTH NORWAY. Astarte 11 (1): 11-20. 1978. SFA 24(2)
[Nordland Reg. Coll., Fish. Div., P.O. Box 309, N-8001 Bodo, Norway] Coastal cod spawns in two well defined areas in the inner part of Ullsfjord, mainly in March and April. Cod eggs sampled regularly from 5 March to 8 July 1974 were almost exclusively in early stages of development. The eggs were more advanced in the outer part of the fjord than closer to the spawning grounds. Only few larvae were found, and not before mid-summer. Meteorological and hydrographical data and drift bottle transport indicated that surface water was transported out of the fjord, by a persisting seaward wind ("bora") early in the period, and later mainly by freshwater outflow. The currents probably transported the cod eggs out of Ullsfjord to coastal waters to the north-east where hatching possibly occurred. It is possible that the coastal cod which spawns in Ullsfjord is part of a larger population which uses different fjords for spawning.

79-001217 Taylor, M. H.; DiMichele, L. PHOTOPERIOD INFLUENCE ON THE SEMILUNAR SPAWNING CYCLE OF /FUNDULUS HETEROCLITUS/. Am. Zool. 18 (3): 668. 1978. Abstract only. SFA 24(2)
[Sch. Life Health Sci., Univ. Del., Newark]

79-001218 van der Horst, G.; Erasmus, T. THE BREEDING CYCLE OF MALE /LIZA DUMERILI/ (TELEOSTEI: MUGILIDAE) IN THE MOUTH OF THE SWARTKOPS ESTUARY. Zool. Afr. 13 (2): 259-273. 1978. SFA 24(2)
[Dep. Zool., Univ. Port Elizabeth, South Africa]

79-001219 Wirtz, P. THE BEHAVIOUR OF THE MEDITERRANEAN /TRIPTERYGION/ SPECIES (PICES, BLENNIOIDEI). J. Comp. Ethol. 48 (2): 142-174. Oct. 1978. In English with German summ. SFA 24(2)
[Max-Planck-Inst., Seewiesen, West Germany]

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC.

79-001220 Barraclough, W. E.; Phillips, A. C. DISTRIBUTION OF JUVENILE SALMON IN THE SOUTHERN STRAIT OF GEORGIA DURING THE PERIOD APRIL TO JULY 1966-1969. Fish. Environ. Can. Fish. Mar. Serv. Tech. Rep. No. 826. iv + 47p. Nov. 1978. In English with French summ. SFA 24(2)
[Fish. Mar. Serv., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] The distribution and relative abundance of juvenile salmon (/Oncorhynchus sp.) in the Fraser plume and southern Strait of Georgia from April through July 1966-1969 was determined from catches made with a two-boat surface trawl. The resulting series of distributional maps suggests that most salmon found off the Fraser estuary in April migrate across the Strait of Georgia, through Active and Porlier Passes during May and June, and are largely absent from open waters by July. Distribtution appears to be influenced considerably by tide and wind generated surface currents and by the volume of fresh water discharge from the Fraser River. In their migration across the Strait, pink, chinook, and coho tend to be more confined to low salinity plume water than are chum or sockeye. In the two years of pink fry abundance, pink were nearly twice as numerous as in 1966, but were about equal in number in 1968. Numbers of sockeye remained fairly constant during all years, but were always lower than those of chum. Chinook and coho were never consistently abundant in catches.

79-001221 Frost, B. W.; McCrone, L. E. VERTICAL DISTRIBUTION, DIEL VERTICAL MIGRATION, AND ABUNDANCE OF SOME MESOPELAGIC FISHES IN THE EASTERN SUBARCTIC PACIFIC OCEAN IN SUMMER. NOAA Fish. Bull. 76 (4): 751-770. 1979. SFA 24(2)
[Dep. Oceanogr., Univ. Wash., Seattle 98195] Vertical distributions of myctophid fishes and other components of the mesopelagic micronekton were determined during the summers of 1973-75 at two stations in the eastern subarctic Pacific Ocean. Stratified samples were collected with a multiple net Tucker trawl so that the entire water column extending to between 385 and 460 m could be sampled during a daytime or nighttime period; two to four day and night vertical series of samples were obtained each summer. Four species of myctophids made up 87 percent of the total fish catch: /Stenobrachius leucopsarus/ and /Diaphus theta/, which performed diel vertical migrations of 300 m vertical extent; and /Protomyctophum thompsoni/ and /S. nannochir/, which exhibited only slight diel variation in vertical distribution. Populations of each myctophid species tended to be vertically stratified by age or size with larger individuals occurring in samples taken progressively deeper. Two other major components of the micronekton were euphausiids and decapod shrimps, chiefly /Euphausia pacifica/ and /Sergestes similis/; both species were conspicuous diel vertical migrators. Samples collected in horizontal hauls immediately following sunset showed that three migratory species, the two migratory myctophids and /E. pacifica/, were closely associated with the single migratory sound-scattering layer (12 kHz); /S. similis/ lagged the ascent of the migratory scattering layer. A single, deep, nonmigratory sound-scattering layer corresponded closely to the distribution of /P. thompsoni/ during both day and night. As in other subpolar oceanic waters, abundance and

79-001221 CONTINUED
standing stock of myctophids were high--0.9 fish/m^2 and 0.37 g dry weight/m^2.

79-001222 LaBar, G. W.; McCleave, J. D.; Fried, S. M. SEAWARD MIGRATION OF HATCHERY-REARED ATLANTIC SALMON (/SALMO SALAR/) SMOLTS IN THE PENOBSCOT RIVER ESTUARY, MAINE: OPEN-WATER MOVEMENTS. J. Cons. Cons. Int. Explor. Mer 38 (2): 257-269. Nov. 1978. SFA 24(2)
[Sch. Nat. Resour., Univ. Vt., Burlington 05401] During May and June, 1975 and 1976, nine hatchery-reared Atlantic salmon (/Salmo salar/) smolts were followed by means of ultrasonic telemetry in the open waters of a bay on their seaward migration. tracks averaged 25.3 km and 13 h 41 min. Smolts in the bay moved rapidly seaward on ebb tides. In the upper part of the study area some reversed movement occurred on flood tides, but in the lower part seaward movement occurred on both ebb and flood tides. Migrating smolts were usually in the upper few metres of water and away from shore. Ground speeds of smolts averaged 51 cm s^{-1} (2 body lengths s^{-1}), and were about twice as high on ebb tides as on flood tides. Vector analysis of fish movement direction showed significant clustering around the water current direction, and water current drift drogues at 2 m and 5 m closely approximated the routes of smolts. Evidence from current drift drogues suggests that water currents are the major transport factor in seaward migration of smolts, but is inconclusive on the question of whether smolts actively swim in addition to seaward transport due to water currents. Routes and rates of travel are apparently not affected by diel changes or environmental factors other than water current.

79-001223 Tytler, P.; Machin, D.; Holliday, F. G. T.; Priede, I. G. A COMPARISON OF THE PATTERNS OF MOVEMENT BETWEEN INDIGENOUS AND DISPLACED BROWN TROUT (/SALMO TRUTTA/ L) IN A SMALL SHALLOW LOCH. Proc. R. Soc. Edinb. Sect. B Biol. Sci. 76 (4): 245-268. 1978. SFA 24(2)
[Univ. Stirling, Scotland] The patterns of movements of indigenous and displaced trout (/Salmo trutta/) in a small loch were obtained by ultrasonic tracking techniques. Comparisons of these were made by developing stochastic simulations of their movements based on an analysis of the frequency distributions of step lengths, angles of turn and the percentage time spent actively swimming. The dispersal and escape of displaced fish from an unfamiliar area of the loch can be explained principally in terms of random turning. Nose plugging appears to influence the distribution of the angles of turn without significantly altering the time taken to escape and return home. Indigenous trout show a strong preference for turns of 180°, indicating a tendency to turn in their tracks. Although a simulation of the indigenous fish shows slower dispersion than displaced fish, it is insufficient to explain the containment of movement within a home range. It is probable that successive steps are not independent and there may be some association between step lengths and subsequent angles of turn. The implications of their autocorrelation are discussed.

79-001224 Vareschi, E. THE ECOLOGY OF LAKE NAKURU (KENYA). II. BIOMASS AND SPATIAL DISTRIBUTION OF FISH (/TILAPIA GRAHAMI/ BOULENGER = /SAROTHERODON ALCALICUM GRAHAMI/ BOULENGER). Oecologia (Berl.) 37 (3): 321-335. 2 Jan. 1979. SFA 24(2)
[Zool. Inst. Univ., Luisenstr. 14, D-8000 Munchen 2, West Germany] The Chichlid fish /Tilapia grahami (=/Sarotherodon alcalicum grahami/) was introduced into Lake Nakuru (Kenya) in about 1960 and is now one of the main herbivores. Spatial distribution and biomass changes were estimated from lift net catches from 1972-1974 which were partly

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continued until 1976. The length/weight relationship is represented by the equation /W/=0.008•/l/ to the 2.98 (/W/=dry weight=24 percent of fresh-weight; /l/=standard length=85.1 percent of total length). The fish distribution is very patchy (aggregation coefficient 5.2-12.2). The density decreased and the mean fish size increased from in-shore to off-shore regions. At noon the fish concentrate near the shore and at night they move off-shore, a migration pattern probably reflecting a preferance for higher temperatures. 70 percent of /Tilapia/ concentrate in the top 50 cm and 80 percent in the top 100 cm. The total ichthyomass of the lake had a mean of 90 t dry weight (=2.1 g/m²) in 1972 and it increased to a mean of 400 t dry weight (=10.2 g/m²) during 1973. Possible causes for the spatial distribution and the biomass variations are discussed. The high density of /Spirulina platensis/ makes nutritional competition among the herbivores unlikely. The main impact of /Tilapia grahami/ on the lake's ecosystem is a substantial increase in diversity by extending the food chains to fish eating birds, of which the Great White Pelican is dominating. The breeding of Pelicans at a neighboring lake causes a considerable nutrient export (about 13 t phosphorus/year).

FOODS AND FEEDING

79-001225 Allan, J. D. TROUT PREDATION AND THE SIZE COMPOSITION OF STREAM DRIFT. Limnol. Oceanogr. 23 (6): 1231-1237. Nov. 1978. SFA 24(2)
[Dep. Zool., Univ. Md., College Park 20742] Nocturnal drift of stream invertebrates is examined as a predator avoidance adaptation via the hypothesis that those taxa or growth stages which are large, and thus subject to intense predation relative to smaller forms, should be most strongly constrained to nocturnal drift activity. Smaller taxa or stages may be aperiodic or day active. Data from an alpine stream document for the abundant and widespread mayfly /Baetis bicaudatus/ that, on a continuum from small to large size, the risk of predation increases while the propensity to drift during the day decreases. There is supporting and some contrary evidence from the literature for the generality of this pattern.

79-001226 Anker, G. Ch. ANALYSES OF RESPIRATION AND FEEDING MOVEMENTS OF THE THREE-SPINED STICKLEBACK, /GASTEROSTEUS ACULEATUS/ L. Neth. J. Zool. 28 (3,4): 485-523. Sept.-Dec. 1978. SFA 24(2)
[Zool. Lab., Dep. Morphol., Rijksuniversiteit Leiden, The Netherlands]

79-001227 Bagge, O. MEAL SIZE AND DIGESTION IN COD (/GADUS MORRHUA/ L.) AND SEA SCORPION (/MYOXOCEPHALUS SCORPIUS/ L.). Medd. Dan. Fisk.-Havunders. 7: 437-446. 1977. SFA 24(2)
[Danish Inst. Fish. Mar. Res., Charlottenlund Castle, DK-2920 Charlottenlund, Denmark] Cod (/Gadus morrhua/ L.) and sea scorpion (/Myoxocephalus scorpius/ L.) have been fed with known amounts of food under aquarium conditions. The emptying of the stomachs as a function of time have been estimated by opening the stomachs of the fish with intervals of 24 hours. It was found that for cod the emptying lasted 115-105 hours and for sea scorpions 132-127 hours at 14.0-15.0°C, and that the emptying was delayed 45-47 hours for sea scorpions at 8.2-10.4°C. It was found that the rate of emptying of the stomachs in seas scorpions increased with the meal size during the total period of empyting, but not during the first 24 hours period, during which the rate of empyting decreased. It was further found that the amount of

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food digested per unit of time is not related to the weight of the fish when equal meal sizes are given.

79-001228 Bailey, W. H. PREDATOR-PREY RELATIONSHIPS IN SELECTED TEXAS RESERVOIRS. Annu. Proc. Tex. Chap. Am. Fish. Soc. 1: 11-24. 1979[1978]. SFA 24(2)
[Tex. Parks Wildl. Dep., Port Aransas 78373] Prey-predator ratios (AP/P) determined in this study compared standing corps of available prey to predators in 29 Texas reservoirs. Forty-one percent of these reservoirs had balanced prey-predator populations while 21 percent did not. Thirty-eight percent of the reservoirs were in the midrange of balance. With modifications, an actual AP/P ratio with percent NUF and percent PD provided three diagnostic tools for Texas fishery managers.

79-001229 Bell, J. D.; Burchmore, J. J.; Pollard, D. A. FEEDING ECOLOGY OF THREE SYMPATRIC SPECIES OF LEATHERJACKETS (PISCES: MONACANTHIDAE) FROM A /POSIDONIA/ SEAGRASS HABITAT IN NEW SOUTH WALES. Aust. J. Mar. Freshwater Res. 29 (5): 631-643. Oct. 1978. SFA 24(2)
[New South Wales State Fish., P.O. Box N211, Grosvenor St., Sydney, N.S.W., Australia 2000] Three species of leatherjackets, /Monacanthus chinensis/, /Meuschenia freycineti/ and /Meuschenia trachylepis/, averaged 34 percent of the total biomass and 27 percent of the total numbers of fishes in a /Posidonia australis/ seagrass habitat near Sydney. /Monacanthus chinensis/ was dominant, comprising 22 percent of the total biomass and 18 percent of the total numbers in this fish community. All three species were omnivorous, consuming considerable amounts of seagrass and algae as well as animal material. However, only the encrusting fauna and epiphytic algae of the seagrass appeared to be actually digested. Other foods of all three species included hydroids, molluscs, crustaceans and polychaetes. /Meuschenia freycineti/ consumed the largest quantities (65 percent) of seagrass, /Monacanthus chinensis/ consumed the largest amount (40 percent) and the greatest variety of animal foods, and /Meuschenia trachylepis/ took the smallest quantity (12 percent) and number of animal foods, and the greatest amount (55 percent) of algae. All three species were found to be highly dependent on the encrusting fauna, epiphytic algae and other epifauna and infauna of this seagrass habitat, and the importance of preserving /Posidonia/ beds is therefore stressed.

79-001230 Bishop, J. M.; Miglarese, J. V. CARNIVOROUS FEEDING IN ADULT STRIPED MULLET. Copeia 1978 (4): 705-707. 28 Dec. 1978. SFA 24(2)
[Mar. Resour. Res. Inst., P.O. Box 12559, Charleston, SC 29412]

79-001231 Bowen, S. H. BENTHIC DIATOM DISTRIBUTION AND GRAZING BY /SAROTHERODON MOSSAMBICUS/ IN LAKE SIBAYA, SOUTH AFRICA. Freshwater Biol. 8 (5): 449-453. Oct. 1978. SFA 24(2)
[Dep. Biol. Sci., Mich. Technol. Univ., Houghton 49931] Distributions of benthic diatoms and benthic floc in lake Sibaya were examined to determine if preferential grazing by juvenile /Sarotherodon mossambicus/ on benthic detrital aggregate in shallow water maximized diatom concentrations in the diet of the fish. Between 0.1 and 12.0 m depth, the range of diatom densities was 1-60 x 10^4 cells cm^{-2} with high but extremely variable densities above 3 m and consistently low densities at greater depths. Light intensity and burial by wave action appear to be primary factors affecting diatom abundance, but the effect of unidentified factors causing local patchiness is also evident. Substrate stabilization by daitoms was observed between 0.3 and 1.8 m depth. Weight of benthic detrital

79-001231 CONTINUED
aggregate generally increased with depth such that diatom concentrations were variable above 3 m but were extremely low in benthic ditrital aggregate at greater depths. Comparison of diatom concentrations in fish stomachs and benthic detrital aggregate shows that within the shallow waters, fish do not selectively graze those areas richest in diatoms.

79-001232 Crawford, P. J. M.; Shelton, P. A. PELAGIC FISH AND SEABIRD INTERRELATIONSHIPS OFF THE COASTS OF SOUTH WEST AND SOUTH AFRICA. Biol. Conserv. 14 (2): 85-109. Sept. 1978. SFA 24(2)
[Dep. Ind., Sea Fish. Br., Beach Rd., Sea Point, 8001, South Africa]

79-001233 Dutta, H. M. FEEDING MECHANISM IN /MICROPTERUS SALMOIDES/. Am. Zool. 18 (3): 622. 1978. Abstract only. SFA 24(2)
[Kent State Univ., Kent, OH]

79-001234 Eggers, D. M. LIMNETIC FEEDING BEHAVIOR OF JUVENILE SOCKEYE SALMON IN LAKE WASHINGTON AND PREDATOR AVOIDANCE. Limnol. Oceanogr. 23 (6): 1114-1125. Nov. 1978. SFA 24(2)
[Fish. Res. Inst., Coll. Fish., Univ. Wash., Seattle 98195] Patterns of limnetic feeding behavior (vertical movement, schooling, diel feeding chronology, zooplankton prey selectivity) of Lake Washington juvenile sockeye salmon are described. A general hypothesis to explain the relative fitness of alternative behaviorial decisions is presented. The limnetic feeding behavior of the salmon appears to minimize their vulnerability to predation by the visual piscivore, northern squawfish. Seasonal variation indicates that sockeye feeding behavior is a short term optimization process involving foraging success and encounters with northern squawfish. Lake Washington sockeye salmon can afford to spend a large amount of their time engaged in antipredator behavior at the expense of foraging success because Lake Washington is comparatively zooplankton-rich and the energy demands of the fish can be met in short foraging periods. Sockeye in other less productive systems show a more aggressive exploitation of the zooplankton.

79-001235 Elliott, J. M.; Persson, L. THE ESTIMATION OF DAILY RATES OF FOOD CONSUMPTION FOR FISH. J. Anim. Ecol. 47 (3): 977-991. Oct. 1978. SFA 24(2)
[Freshwater Biol. Assoc., Windermere Lab., Ambleside, Cumbria LA22 1P, England] Previous studies on rates of gastric evacuation and food consumption are briefly reviewed and criticized. The truly quantitative studies show that the evacuation rate is usually exponential and is related to water temperature by an exponential or power-law function. These relationships have been ignored in most of the previous methods used to estimate the daily food consumption for fish in the field. Two new methods are proposed and both assume that the rate of gastric evacuation is exponential. The rate of food consumption is assumed to be constant within the interval between sampling in the first method, and to decrease with time in the second method which also requires an estimate of the satiation ration. Equations are developed for both methods. In a series of experiments with brown trout and perch, the first method usually provided close estimates of the daily food consumption even when feeding was restricted to short periods at infrequent intervals of time. The first method was inadequate, and the second method more appropriate, for larger fish feeding close to the maximum or satiation level. The new methods are compared with some of the equations of earlier workers and

79-001235 CONTINUED
the latter are shown to have often made erroneous assumptions that produced underestimates of the daily food consumption.

79-001236 Forester, J. S.; Avault, J. W., Jr.; Huner, J. V. EFFECTS OF GRASS CARP ON THE FRESHWATER RED SWAMP CRAWFISH AND RIVER SHRIMP IN ARTIFICIAL POOLS. Proc. La. Acad. Sci. 41: 42-47. 1978. SFA 24(2)
[Sch. For. Wildl. Manage., La. State Univ., Baton Rouge 70803] Grass carp, /Ctenopharyngodon idella/, stocked in metal pools at rates of 1,563 and 1,706 per ha did not significantly affect growth of crawfish, /Procambarus clarkii/, or river shrimp, /Macrobrachium ohione/, in a 12 week study. Plant material was the dominant food item found in grass carp stomachs. Some animal material was found, mainly cladocerans, gyrind beetles, and anisopterans; however, no crawfish or shrimp were found.

79-001237 Griffiths, W. E. FEEDING AND GASTRIC EVACUATION IN PERCH (/PERCA FLUVIATILIS/ L.). Mauri Ora 4: 19-34. 1976. SFA 24(2)
[Dep. Zool., Univ. Canterbury, Christchurch, New Zealand] The gastric evacuation rate of perch was determined at 17 ± 1°C using the common New Zealand bully (/Gobiomorphus cotidianus/), as food. Approximately 16 h were required for 90 percent evacuation. The gastric evacuation rate decreased exponentially with time after initial ingestion. Force feeding and starvation periods in excess of 7 days reduced the evacuation rate. A mathematical model was developed, using the evacuation rate, to determine diel feeding periodicity. Perch were shown to be most active in daylight hours (88 percent feeding). Peak feeding times in the Selwyn River, Canterbury during summer were 1100 h and 1900 h. Behavioural observations made in the laboratory and the field indicate that perch are visual feeders and that they can develop searching images for specific prey. While hunting, the prey attack sequence was initiated when a "critical" distance of 50-100 mm was reached between the perch and the prey.

79-001238 Habib, G. FOOD SIZE PREFERENCES OF THE RED COD /PSEUDOPHYCIS BACCHUS/ (TELEOSTEI: MORIDAE). Mauri Ora 4: 9-13. 1976. SFA 24(2)
[Fish. Res. Div., Minist. Agric. Fish., Wellington, New Zealand] The stomachs of 2,294 red cod /Pseudophycis bacchus/ taken from Canterbury waters, New Zealand, between October 1971 and October 1972 were examined: 1,383 contained food. Prey species identified were: 46 fish, 46 crustaceans, 9 molluscs, 3 urochordates, 1 annelid and 1 echinoderm; 12 items were unidentified. Small cod (less than 250 mm) fed predominantly on small invertebrates, medium cod (250-450 mm) fed on fewer invertebrates and on fishes from 40-100 mm in length, and large cod (greater than 450 mm) took still fewer invertebrates and also fishes from 100-300 mm in length. Invertebrates in the diet of large red cod were the seasonally abundant decapod crustacea /Nectocarcinus antarcticus/, /Ovalipes punctatus/ and /Munida gregaria/.

79-001239 Holanov, S. H.; Tash, J. C. PARTICULATE AND FILTER FEEDING IN THREADFIN SHAD, /DOROSOMA PETENENSE/, AT DIFFERENT LIGHT INTENSITIES. J. Fish Biol. 13 (5):619-625. Nov. 1978. SFA 24(2)
[Ariz. Coop. Fish. Res. Unit, Univ. Ariz., Tucson] Previous workers inferred from stomach analyses that threadfish shad (/Dorosoma petenense/) ate plankton by both filter and particulate feeding. These inferences were confirmed in this study by laboratory experiments in which both types of feeding were observed. Threadfin shad consumed relatively small food particles (less than or equal to 0.39 mm) by

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filtration, while larger prey (7.5 mm) were eaten individually. The shad were able to filter feed on small foods (brine shrimp nauplii and phytoplankton) at all light intensities from 0 to $9x10^{1}$fL. These data indicate that under natural conditions shad can filter feed at any time of the 24h period if food conditions are sufficient to trigger feeding. Filter feeding is probably induced by chemoreception rather than vision. The particulate feeding rate decreased as light intensity decreased, reaching a minimum between $9x10^{-4}$ and $9x10^{-3}$fL. From these data it is inferred that particulate feeding is a visual process in this species, requiring intensities equivalent to bright moonlight or greater. Filter and particulate feeding abilities allow threadfin shad to consume most of the different types of plankton and to change their diet with seasonal changes in the composition of the plankton.

79-001240 Horwath, K. L.; Morgan, D. W. POSSIBLE PHYSIOLOGICAL CLOCK ASSOCIATED WITH THE FEEDING HABITS OF THE CENTRAL MUDMINNOW (/UMBRA LIMI/) KIRTLAND. Proc. Indiana Acad. Sci. 87: 230-237. 1977. SFA 24(2)
[Dep. Biol., Univ. Notre Dame, Notre Dame, IN]

79-001241 Johnsen, B. O. SEASONAL VARIATIONS IN THE DIET OF THE BROWN TROUT (/SALMO TRUTTA/ L.) IN A NORWEGIAN MOUNTAIN LAKE COMPARED WITH THE VARIATIONS IN THE PLANKTON AND BOTTOM FAUNA. Astarte 11 (1): 37-43. 1978. SFA 24(2)
[Div. Wildl. Freshwater Fish, N-7000 Trondheim, Norway] The seasonal variations in the plankton fauna, the bottom fauna, and the feeding habits of the brown trout (/Salmo trutta/ L.) in Lake Dalsvatn, an oligotrophic mountain lake of 52 ha in central Norway, were studied in the period October 1970 to October 1971. Bottom food dominated the diet, plankton food being important especially for smaller trout in autumn and winter. Surface food was eaten in the ice-free season. The bottom fauna consisted mainly of Oligochaeta, Hirundinea, Chironomidae, Trichoptera, Ephemeroptera, and Gastropoda. Of these groups the insect larvae, especially Trichoptera, were important as trout food. The plankton fauna was dominated by /Bosmina longispina/, but /Daphnia galeata/ was the most important prey of the trout.

79-001242 Jones, B. C. FEEDING BEHAVIOR AND SURVIVAL OF PACIFIC SPINY DOGFISH IN CAPTIVITY. Prog. Fish-Cult. 40 (4): 157. Oct. 1978. SFA 24(2)
[MacLaren Marex Inc., 1000 Windmill Rd., Dartmouth, NS B3B 1L7, Canada]

79-001243 Karagitsou, H.; Tsimenidis, N. [FOOD OF HAKE (/MERLUCCIUS MERLUCCIUS/) IN SARONIKOS GULF.] Thalassographica 1 (3): 232-244. Dec. 1977. In Greek with English summ. SFA 24(2)
[Inst. Oceanogr. Fish. Res., Athens, Greece]

79-001244 Lauder, G. V. FUNCTIONAL ANATOMY OF FEEDING IN PRIMITIVE ACTINOPTERYGIAN FISHES. Am. Zool. 18 (3): 622. 1978. Abstract only. SFA 24(2)
[Harvard Univ., Cambridge, MA]

79-001245 Layzer, J. B.; Reed, R. J. FOOD, AGE AND GROWTH OF THE TESSELLATED DARTER, /ETHEOSTOMA OLMSTEDI/, IN MASSACHUSETTS. Am. Midl. Nat. 100 (2): 459-462. Oct. 1978. SFA 24(2)
[U.S.FWS, 451 Russell St., Hadley, MA 02189] Tessellated darters (/Etheostoma olmstedi/) fed primarily on tendipedid larvae in the Connecticut and Mill rivers from June to September, but by October shifted to a diet of Trichoptera larvae in the Mill River. Feeding in the Mill River on 8-9 July 1970 occurred throughout daylight hours but was heaviest between 0600 and 1200. Back-calculated lengths varied within age groups and the length ranges overlapped between age groups in the five darter populations studied. In the Mill River, young darters appeared to remain near a spawning area until they reached about 30 mm TL.

79-001246 Liem, K. F. MODULATORY MULTIPLICITY IN THE FUNCTIONAL REPERTOIRE OF THE FEEDING MECHANISM IN CICHLID FISHES. I. PISCIVORES. J. Morphol. 158 (3): 323-360. Dec. 1978. SFA 24(2)
[Mus. Comp. Zool., Harvard Univ., Cambridge, MA 02138]

79-001247 Major, P. F. PISCIVOROUS PREDATORS AND DISABLED PREY. Copeia 1979 (1): 158-160. 20 Feb. 1979. SFA 24(2)
[11597 North Shore Dr. (1c), Reston, VA 22090]

79-001248 Nakashima, B. S.; Leggett, W. C. DAILY RATION OF YELLOW PERCH (/PERCA FLAVESCENS/) FROM LAKE MEMPHREMAGOG, QUEBEC-VERMONT, WITH A COMPARISON OF METHODS FOR IN SITU DETERMINATIONS. J. Fish. Res. Board Can. 35 (12): 1597-1603. Dec. 1978. In English with French summ. SFA 24(2)
[Dep. Biol., McGill Univ., Montreal, P$ H3A 1B1, Canada]

79-001249 Newsome, G. E. (Buck); Gee, J. H. PREFERENCE AND SELECTION OF PREY BY CREEK CHUB (/SEMOTILUS ATROMACULATUS/) INHABITING THE MINK RIVER, MANITOBA. Can. J. Zool. 56 (12): 2486-2497. Dec. 1978. In English with French summ. SFA 24(2)
[Dep. Biol., St. Francis Xavier Univ., Antigonish, NS B2G 1C0, Canada] In the Mink River, Manitoba, adult creek chub were observed to be selective feeders consuming brook stickleback in early summer and crayfish in late summer despite an abundance of other potential prey fishes, particularly johnny darters and a number of cyprinids. Laboratory experiments conducted to investigate preference, utilizing creek chub from two isolated populations, Mink River and Norquay Channel, Manitoba, demonstrated that both brook stickleback and crayfish were preferred least, ranking behind johnny darters and two species of cyprinids, pearl dace, and common shiners, respectively. Subsequent experiments were conducted to examine a number of possible factors which might reduce or increase the accessibility of potential prey species. Results revealed that the johnny darter, although preferred, was protected from predation by creek chub by the presence of a rocky substrate. Similarly the presence of simulated rooted aquatic vegetation reduced the accessibility of brook stickleback. The inaccessibility of cyprinids was not attributable to a pheromone-induced fright reaction but possibly to their countershading.

79-001250 Oswald, R. L. THE USE OF TELEMETRY TO STUDY LIGHT SYNCHRONIZATION WITH FEEDING AND GILL VENTILATION RATES IN /SALMO TRUTTA/. J. Fish Biol. 13 (6): 729-739. Dec. 1978. SFA 24(2)
[Dep. Biol., Univ. Stirling, Scotland] A technique is described whereby the electromyogram of the /M. adductor mandibulae/ of brown trout is detected by implanted extracellular electrodes and used as the input signal for an ultrasonic transmitter attached externally to the fish. The periodic electrical activity of the muscle during ventilation is relayed by the transmitter using an analogue pulse system. As the ventilatory electromyogram occurs in discrete rhythmic trains, it follows that alterations to this rhythm can be used to telemeter, instantaneously, single feeding events from a free swimming fish. Laboratory tests have shown that the feeding act is unequivocally distinct electromyographically from other manoeuvres such as 'coughing'. Four adult brown trout have been equipped with this transmitter system and released in Airthrey Loch, Stirling. Using a tracking facility, feeding activity and ventilatory rhythms have been recorded for extended periods. The results indicated the presence of three daily peaks of feeding activity, which is discussed in relation to changes in light levels. The telemetry records indicate that night feeding is a common occurrence in brown trout. In addition, ventilatory rates were found to be at or near resting levels.

79-001251 Smyly, W. J. P. FURTHER OBSERVATIONS ON LIMNETIC ZOOPLANKTON IN A SMALL LAKE AND TWO ENCLOSURES CONTAINING FISH. Freshwater biol. 8 (5): 491-495. Oct. 1978. SFA 24(2)
[Freshwater Biol. Assoc., The Ferry Horse, Ambleside, Cumbria LA22 0LP, England] In a small lake (Blelham Tarn, English Lake District) two plastic cylinders, each of which extends from the lake surface to the bottom sediments and encloses 18,000 m^3 of water, were used to investigate effects of enclosure on the zooplankton. This paper describes observations from March 1973 to October 1974 and is the second part of a report on a project spanning 4 years. Seasonal population densities of the more abundant species were essentially similar to those observed in the first part of the project, despite large changes in algal and predator populations. In the enclosures, fish (mostly /perca fluviatilis/) populations are known from observations by divers to have been large in the period under consideration and small in the first part of the project. Populations of /Chaoborus/ larvae in the enclosures were small at all seasons from March 1973 to October 1974.

79-001252 Stasiak, R. H. FOOD, AGE AND GROWTH OF THE PEARL DACE, /SEMOTILUS MARGARITA/, IN NEBRASKA. Am. Midl. Nat. 100 (2): 463-466. Oct. 1978. SFA 24(2)
[Dep. Biol., Univ. Nebr., Omaha 68182] A total of 315 pearl dace (/Semotilus margarita nachtriebi/) were collected from Bone Creek, a tributary to the Niobrara River, in Brown Co., Nebraska, on 30 March 1974. The sex ratio of mature specimens was 1:1, but females grew faster, lived longer (age IV compared to age III for males) and attained greater size. Both sexes achieved sexual maturity after the second winter (age I). Food items included a wide variety of invertebrates representing benthic as well as surface organisms. Copepods and cladocerans were important in the diet of small (less than 54 mm) fish, but large fish (greater than 74 mm) consumed larger animals such as snails, fingernail clams, amphipods and large insects. Diptera larvae and adults were the most frequent items in the diet of dace of all size groups.

79-001253 Stenson, J. A. E. RELATIONS BETWEEN VERTEBRATE AND INVERTEBRATE ZOOPLANKTON PREDATORS IN SOME ARCTIC LAKES. Astarte 11 (1): 21-26. 1978. SFA 24(2)
[Dep. Zool., Univ. Goteborg, Pack, s-400 33 Goteborg 33, Sweden] The distribution and predatory influence of some invertebrate zooplankton predators aré probably closely related to fish predation. /Chaoborus obscuripes/ was recorded only in lakes devoid of fish while /C. flavicans/ and /bythotrephes longimanus/ were recorded as well in lakes with a low predation pressure from fish.

79-001254 Thresher, R. E. POSSIBLE MUCOPHAGY BY JUVENILE /HOLACANTHUS TRICOLOR/ (PISCES: POMACANTHIDAE). Copeia 1979 (1): 160-162. 20 Feb. 1979. SFA 24(2)
[Scripps Inst. Oceanogr., A-002, La Jolla, CA 92093]

79-001255 Ursin, E. ON THE PREY SIZE PREFERENCES OF COD AND DAB. Medd. Dan. Fisk.- Havunders. 7: 85-98. 1973. SFA 24(2)
[Danish Inst. Fish. Mar. Res., Charlottenlund Castle, DK-2920 Charlottenlund, Denmark] The prey size preference of predators is described as a log-normal frequency distribution of predator-weight/prey-weight except when some prey species is exceptionally available to the predator. On estimating the parameters of the distribution from stomach contents differences in abundance of prey of each size in the environment must be accounted for. For bottom animals numbers in the environment were found inversely proportional to body weight.

79-001256 van den Broek, W. L. F. DIETARY HABITS OF FISH POPULATIONS IN THE LOWER MEDWAY ESTUARY. J. Fish Biol. 13 (5): 645-654. Nov. 1978. SFA 24(2)
[Fish. Res. Div., Minist. Agric. Fish., P.O. Box 19062, Wellington, New Zealand] Populations of mainly first-year fish overwinter in the Medway Estuary, an area offering shelter and a rich and varied food supply. In the absence of previous investigations, the present study examines the dietary habits of four fish species; gadoids /Merlangius merlangus/ and /Trisopterus luscus/, and pleuronectids /Platichthys flesus/ and /Pleuronectes platessa/. Gadoids fed predominantly on fast moving nektonic organisms such as brown shrimps, mysids and fish while pleuronectids preferred the slower moving tubificid and polychaete worms. Seasonal fluctuations of the dietary constituents are considered in relation to charges within the populations of both prey and predator organisms.

79-001257 Walker, M. H. FOOD AND FEEDING HABITS OF /LETHRINUS CHRYSOSTOMUS/ RICHARDSON (PISCES: PERCIFORMES) AND OTHER LETHRINIDS ON THE GREAT BARRIER REEF. Aust. J. Mar. Freshwater Res. 29 (5): 623-630. Oct. 1978. SFA 24(2)
[West. Australian Mar. Res. Lab., P.O. Box 20, North Beach, Western Australia 6020] Gut contents were examined in 299 sweetlip emperor /L. chrysostomus/ from the Great Barrier Reef, near Townsville, Qld. Occurrence and points (bulk) methods of analysis were used. Both methods showed that the major dietary items were crustaceans, echinoderms and molluscs, crabs and seas urchins being the most important. Examination of other lethrinids quantitatively and qualitatively suggested that lethrinid species are carnivorous bottom feeders quite selective and individualistic in their diet.

79-001258 Wankowski, J. W. J. MORPHOLOGICAL LIMITATIONS, PREY SIZE SELECTIVITY, AND GROWTH RESPONSE OF JUVENILE ATLANTIC SALMON, /SALMO SALAR/. J. Fish Biol. 14 (1): 89-100. Jan. 1979. SFA 24(2)

[Dep. Agric. Fish., Faskally, Pitlochry, Perthshire, Scotland] The head and jaw movements involved in capture, buccal manipulation, ingestion and rejection of prey were investigated using sequential photography of juvenile Atlantic salmon feeding in a simulated stream environment. The results are described and discussed and mouth breadth and gill raker spacing are proposed as morphometric limitations to the range of prey sizes abailable which remains constant at 0.06 x fish fork length (PFR). A recirculatory flume tank was used to study prey size selectivity behavior. Simplified downstream-drifting prey items elicited a variety of responses depending on their physical size. One hundred percent of offered prey of PFR 0.025 were ingested, while 90 percent of prey at PFR 0.051 and 100 percent of prey at PFR 0.105 were rejected. It is demonstrated that fish show negative selection for prey sizes smaller than PFR 0.025 and that prey of this size elicits maximum growth response. The validity of the proposed morphometric limitations on the available prey sizes is demonstrated by reference to selectivity behaviour and prey size related differential growth.

79-001259 Whitfield, A. K.; Blaber, S. J. M. FOOD AND FEEDING ECOLOGY OF PISCIVOROUS FISHES AT IAKE ST LUCIA, ZULULAND. J. Fish Biol. 13 (6): 675-691. Dec. 1978. SFA 24(2)

Zool. Dep., Univ. Natal, P.O. Box 375, Pietermaritzburg, South Africa] The food and feeding ecology of piscivorous fish in Lake St Lucia was monitored for two years. Piscivorous fishes feed predominantly on the planktivorous /Gilchristella aestuarius/ and /Thryssa vitrirostris/ but a wide range of prey species was recorded. Numbers of the predominant piscivores, /Argyrosomus hololepidotus/ and /Elops machnata/, in an area appear to be related to the densities of their major prey, /T. vitrirostris/ and /G. aestuarius/. Large piscivorous fishes are restricted to the deeper portions of the lake, whereas small piscivores such as /Johnius belengerii/ and /Terapon jarbua/ feed predominantly on small fishes in the littoral zone. The highly significant correlattion between the composition of prey fish species in the lake and prey fish species in the diet of piscivorous fishes, indicates that piscivores are feeding in a density dependent manner. However, factors such as habitat, fish size and swimming speed of prey species are shown to be important in prey selection. Juvenile fish of species such as /Sarotherodon mossambicus/, /Liza macrolepis/ and /Acanthopagrus berda/ remain in shallow marginal areas, thus avoiding large piscivorous fishes. However by frequenting shallow areas these species become vulnerable to bird predators, especially egrets and herons.

79-001260 Wiley, R. W.; Varley, J. D. THE DIET OF RAINBOW AND BROWN TROUT FROM FLAMING GORGE RESERVOIR, 1964 THROUGH 1969. Wyo. Game Fish Dep. Fish. Res. Rep. Monogr. Ser. No. 1. p. 1-16. July 1978. SFA 24(2)

[Wyo. Game Fish Dep., Laramie] Data are presented relative to the use of food by trout during the first six years of impoundment of Flaming Gorge Reservoir. A total of 1,343 stomachs from rainbow trout, 64 from brown trout and six from cutthroat trout were analysed during the project. We found the primary food of rainbow trout to be zooplankton. Brown trout included zooplankton as a major part of their diet and also used significant quantities of forage fish. It was apparent that zooplankton sustained both rainbow and brown for a good portion of their life. Too few cutthroat were sampled to make comparisons justifiable. We described five major food items, that is those items that comprised generally more than 15.0 percent of stomach

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volume: zooplankton, organic debris, fish, diptera and hymenoptera. The use of forage fish declined down-reservoir during the study and was positively correlated with forage fish abundance. Generally, zooplankton was an important food item in all areas. Dipterans were more common in the stomachs of rainbow captured in the canyon area. No intensive intra-specific competition for food was demonstrated although rainbow and brown used comparable quantities of zooplankton in all areas. Growth of each species was better than average and we concluded that a positive correlation existed between food availability and trout growth and the competition for food was not significant. Brown trout 126 to 455 mm included significantly greater amounts of fish in their diet than did rainbow. Fish over 457mm of both species took comparable quantities of fish.--From abstr.

AGE AND GROWTH

79-001261 Barkman, R. C. THE USE OF OTOLITH GROWTH RINGS TO AGE YOUNG ATLANTIC SILVERSIDES, /MENIDIA MENIDIA/. Trans. Am. Fish. Soc. 107 (6): 790-792. Nov. 1978. SFA 24(2)
[Biol. Dep., Springfield Coll., Springfield, MA 01109]

79-001262 Boetius, J. ELVERS, /ANGUILLA ANGUILLA/ AND /ANGUILLA ROSTRATA/ FROM TWO DANISH LOCALITIES. SIZE, BODY WEIGHT, DEVELOPMENTAL STAGE AND NUMBER OF VERTEBRAE RELATED TO TIME OF ASCENT. Medd. Dan. Fisk.- Havunders. 7: 199-220. 1976. SFA 24(2)
[Danish Inst. Fish. Mar. Res., Charlottenlund Castle, DK-2920 Charlottenlund, Denmark] Ascending elvers were studied at Hojer and Esrom. /Hojer/ (/0-group/). The Firstly arriving elvers measured abt. 1.5 mm more than elvers of same stages from the later arriving groups. Body weights decreased remarkably during ascent. Total numbers of vertebrae were shown to be positively correlated with total lengths for individual developmental stages. Early ascending elvers of stages V B (Gilson) had lower numbers of total vertebrae than any other group counted. /Estrom/ (/0- and I-group/). The postive correlation stated between vertebrae numbers and total lengths did continue through the two year classes. At both localities a small amount (abt. 0.3 percent) of /Anguilla rostrata/ elvers was present. The maximum frequency (1.1 percent) was noted in the firstly arriving Group at Hojer.

79-001263 Brothers, E. B. EXOGENOUS FACTORS AND THE FORMATION OF DAILY AND SUBDAILY GROWTH INCREMENTS IN FISH OTOLITHS. Am. Zool. 18 (3): 631. 1978. Abstract only. SFA 24(2)
[Sect. Ecol. Syst., Cornell Univ., Ithaca, NY 14853]

79-001264 Cadwallader, P. L. GRAPHICAL FITTING OF THE VON BERTALANFFY EQUATION. Mauri Ora 3: 11-17. 1975. SFA 24(2)
[Fish. Wildl. Div., Minist. Conserv., 632 Bourke St., Melbourne, Victoria, Australia 3000] The parameters of the von Bertalanffy equation were estimated graphically using mean annaual length data derived from the common river galaxias, /Galaxias vulgaris/ Stokell. For males: l(t) = 115.7 (1 - e to the -0.3705 (t + 1.091)) and for females: l(t) = 156.9 (1 - e to the -0.2366 (t + 1.106)). These equations adequately described annual growth in length up to the end of the fourth year. The estimates of the parameters were similar to those obtained using Allen's least squares method. It is considered that, although the Allen method is more exact, the graphical method provides an adequate alternative means of estimating the parameters of

79-001264 CONTINUED
the von Bertalanffy equation.

79-001265 de Ciechomski, J. D.; Cassia, M. C. STUDIES ON THE GROWTH OF JUVENILES OF /CYNOSCION STRIATUS/ IN THE SEA AND IN ASUARIA. J. Fish Biol. 13 (5): 521-526. Nov. 1978. SFA 24(2)
[Inst. Nac. Invest. Desanollo Pesq., Mar del Plata, C.C. 175, Argentina]

79-001266 FISCHWACHSTUM BEI OLIGO-, MESO- UND EUTROPHIE DES BODENSEES. [GROWTH OF FISHES DURING OLIGO-, MESO- AND EUTROPHIC STATUS OF LAKE CONSTANCE.] Swiss J. Hydrol. 40 (1): 32-39. 1978. In German with French and English summ. SFA 24(2)
[Inst. Seenforsch. Fischereiwesen, Langenargen, Switzerland] Recent growth of 14 fish taxa of Lake Constance has been studied. In the mesotrophic basin summer-pelagic species opposite to the others appear to grow faster now than during earlier oligotrophic status. From trends of growth, feeding and yeild (table) it is concluded that eutrophication has favoured plankitivores. In the eutrophic lower basin only coregonids grow slower than in the mesotrophic part of the lake. Factors that have caused growth differences are thought to be food density and water temperature (through changed fish distribution and different shape of basin).

79-001267 Frost, W. E. THE SCALES OF THE CHARR, (/SALVELINUS WILLUGHBII/ GUNTHER), IN WINDERMERE, AND THEIR USE FOR THE DETERMINATION OF AGE AND GROWTH. J. Cons. Cons. Int. Explor. Mer 38 (2): 208-215. Nov. 1978. SFA 24(2)
[Freshwater Biol. Assoc., The Ferry House, Ambleside, Cumbria LA22 OLP, England]

79-001268 Grant, C. J.; Cowper, T. R.; Reid, D. D. AGE AND GROWTH OF SNOEK, /LEIONURA ATUN/ (PERCIFORMES), IN SOUTH-EASTERN AUSTRALIAN WATERS. Aust. J. Mar. Freshwater Res. 29 (4): 435-444. Aug. 1978. SFA 24(2)
[Zool. Dep., Univ. West Indies, Mona, Kingston 7, Jamaica]

79-001269 Habib, G. MEASURING GROWTH ZONES IN IRREGULARLY SHAPED OTOLITHS BY MEANS OF A PLANIMETER. Mauri Ora 4: 133-137. 1976. SFA 24(2)
[Fish. Res. Div., Minist. Agric. Fish., Wellington, New Zealand] This paper describes the use of a compensating polar planimeter for measuring areas of growth zones of otoliths in enlarged drawings of otoliths from the pufferfish /Uranostoma richei/ (Preminville). Because pufferfish otoliths become increasingly crenellated in outline with growth, measurement of length and width are unsatisfactory for describing growth. However, measurements of area showed that otoliths increase in size in a regular manner from year to year. This method is especially suitable for measuring irregularly shaped otoliths.

79-001270 Hillden, N.-O. AN AGE LENGTH KEY FOR /CTENOLABRUS RUPESTRIS/ (L) IN SWEDISH WATERS. J. Cons. Cons. Int. Explor. Mer 38 (2): 270-271. Nov. 1978. SFA 24(2)
[Tjarno Marinbiol. Lab., P1 2781, S-452 00 Stromstad, Sweden]

79-001271 Hoestlandt, H.; Rudelle, J. EXAMEN ELECTRONI$UE DENSITOMETRI$UE D'OPERCULES DE PERCHES (/PERCA FLUVIATILIS/ L.) EN VUE DE LA DETERMINATION DE L'AGE DES POISSONS. [ELECTRONIC DENSITOMETRIC EXAMINATION OF OPERCULAR BONES OF PERCHES (/PERCA FLUVIATILIS/ L.) TO DETERMINE THE AGE OF THE FISH.] C.R. Hebd. Seances Acad. Sci. Ser. D Sci. Nat. 288 (1): 117-118. 8 Jan. 1979. In French with English summ. SFA 24(2)
Lab. Biol. Mar., Fac. Cath. Lille, 62164 Ambleteuse, France]

79-001272 Jorgensen, S. E. A MODEL OF FISH GROWTH. Ecol. Model. 2 (4): 303-313. Dec. 1976. SFA 24(2)
[Danmarks Farmaceutiske Hojskole, Universitetsparken, Copenhagen, Denmark] A fish model based upon mass balances is set up. Several of the parameters have been determined by experiment. The remaining parameters are based upon literature values and it was not necessary to find any parameter by calibration. The model was validated with a completely acceptable result. The model includes equations giving the fish growth, the production of ammonia and organic matter, the oxygen consumption, and the influence of the temperature. The model can be used for management of fish farms and as a submodel for a total aquatic system.

79-001273 Kanda, T.; Itazawa, Y. [GROUP EFFECT ON PHYSIOLOGICAL AND ECOLOGICAL PHENOMENA IN FISH. II. GROUP EFFECT ON THE GROWTH OF THE MEDAKA.] Bull. Jpn. Soc. Sci. Fish. 44 (11): 1197-1200. Nov. 1978. In Japanese with English summ. SFA 24(2)
[Dep. Fish., Fac. Agric., Kyushu Univ. 46-04, Hakozaki, Higashi-ku, Fukuoka, 812, Japan] Effects of density and group size on food intake and growth rate were studied with immature medaka. Higher density reduced the growth rate in the groups of more than two fish. In the fixed density (300 cm^3/1 fish), the growth rate and the feed conversion efficiency increased with increase of group size up to six fish. No relationship was observed between the food intake and the group size. The results of the present and previous studies imply that the growth rate increased with increase of group size up to six fish, because of increased feed conversion efficiency owing to decreased oxygen consumption per unit weight, although the food intake did not increase.

79-001274 Kipling, C.; Frost, W. E. THE WEIGHT-LENGTH RELATIONSHIP OF CHARR, (/SALVELINUS WILLUGHBII/ GUNTHER), IN WINDERMERE. J. Cons. Cons. Int. Explor. Mer 38 (2): 216-219. Nov. 1978. SFA 24(2)
[Freshwater Biol. Assoc., The Ferry House, Ambleside, Cumbria LA22 OLP, England] The weight-length relationships of several groups of charr, /Salvelinus willughbii/ Gunther, in Windermere have been investigated. For mature charr of normal growth no significant differences in the slopes of the weight-length regression lines were found between males and females, nor between spring spawners and autumn spawners; the weight-length relationship of all mature charr of normal growth can be described by the equation $y = -1.67 + 2.81x$ where y is log weight in g and x is log fork length in cm. The weight-length relationship of immature charr differed very significantly from that of mature charr of normal growth, and can be described by the equation $y = -2.36 + 3.27x$. Some mature charr tentatively indentified as

79-001274 CONTINUED
"dwarfs" by their slow growth differed very significantly in weight-length relationship from mature charr of normal growth. But there were no significant differences between mature "dwarfs" and immature charr of both normal and "dwarf" growth as regards weight-length relationship.

79-001275 Laurence, G. C. LARVAL LENGTH-WEIGHT RELATIONS FOR SEVEN SPECIES OF NORTHWEST ATLANTIC FISHES REARED IN THE LABORATORY. NOAA Fish. Bull. 76 (4): 890-895. 1979. SFA 24(2)
[NMFS, R.R. 7A, Box 522A, Narragansett, RI 02882]

79-001276 Linfield, P. S. J. AGE DETERMINATION AND YEAR CLASS STRUCTURE IN A STUNTED ROACH, /RUTILUS RUTILUS/ POPULATION. J. Fish Biol. 14 (1): 73-87. Jan. 1979. SFA 24(2)
[Anglian Water Auth., Diploma House, Grammar School Walk, Huntingdon, Cambs. PE18 6NZ, England] In an investigation into changes in the growth and biology of a stunted roach population, details are given of the methods of sampling and examination of the material. Studies on the growth of scales and opercula indicate that roach in all year classes formed a distinct annulus on both structures during May/June each year and fish in their second year of life also formed an additional check in the late summer/autumn of both 1969 and 1970. Reference is made to previously published descriptions of the particular difficulties, and their soulutions, involved in aging stunted roach and evidence is cited for the validity of the methods used. Data on age distribution in the samples suggests that the 1966 year class was absent from the lake involved by late 1969 and that the 1965 and 1967 year classes were also very weak. Comparison is made with the results of other authors and the significance of the weak year classes is briefly discussed.

79-001277 Moreau, J. ESSAI D'INTERPRETATION DES ANNULI OBSERVES SUR LES ECAILLES DE /TILAPIA NILOTICA/ ET /TILAPIA RENDALLI/ DES LACS DES HAUTS PLATEAUS MALGACHES. III. OBSERVATIONS SUR /TILAPIA NILOTICA/ AU LAC ALOATRA. [INTERPRETATION TRIAL OF THE ANNULI OBSERVED ON SCALES OF /TILAPIA NILOTICA/ AND /TILAPIA RENDALLI/ OF THE LAKES OF MALAGASY HIGHLANDS. III. OBSERVATIONS OF /TILAPIA NILOTICA/ ON LAKE ALOATRA.] Ann. Hydrobiol. 8 (3): 363-373. 1977. In French with English summ. SFA 24(2)
[Lab. Ichtyol. Appl. Ecol. Natl. Super. Agron., 31076 Toulouse, France] Ring formations are observed on the scales of /Tilapia nilotica/ of the Aloatra lake on malagasy highlands. The suitability of using these rings for age determining methods is discussed. It is possible that, within one year these rings show two growth stops. The first occurs at the beginning of the rainy season and the second during the cool and dry season. At these times the fishes are chiefly involved with nutritional difficulties.

79-001278 Papageorgiou, K. N. [AGE AND GROWTH OF PERCH (/PERCA FLUVIATILIS/ L.) IN LAKE AGHIOS VASILIOS.] Thalassographica 1 (3): 245-265. Dec. 1977. In Greek with English summ. SFA 24(2)
The present study was undertaken on the Lake of Agios Vasilios (45 Km²) to determine the relationships between total and standard length, length and weight, condition factor, the age and growth of perch (/Perca fluviatilis/ L.). On the basis of measurements of 709 fishes captured randomly during 1975-76, the following biological information was obtained. The perch's span of life was found 10 years, and this applies to both sexes. Female perch grew more rapidly and attained greater ultimate than the males. The growth increment is greater

79-001278 CONTINUED
during the first year of life about 70 mm, decreasing to approximately 15 mm at the end of the fifth year and after that becoming constant at about 10 mm per year. The perch's growth in the Lake of Agios Vasilios was found satisfactory in comparison with other biotopes of Europe. The length-weight relationship of the sexes can be described by the equation $W=0.012667\ L^{3.16925}$, where W = pure body weight in g and L = standard length in cm. The average condition factor "k" of all Perch was 2.01 with a range of 1.79-2.10. The reproductive organs begin to increase in weight for males at a S.L. 78 mm and for females at a S.L. 100 mm. The conversion factors from total length (T.L.) to standard length (S.L.) for the three length groups (8-11, 11-15 and 15-23 cm) were found to be 0.766-0.853 and 0.886 respectively.--summ.

79-001279 Prentice, J. A.; Durocher, P. P. AVERAGE GROWTH RATES FOR LARGEMOUTH BASS IN TEXAS. Annu. Proc. Tex. Chap. Am. Fish. Soc. 1: 49-57. 1979[1978]. SFA 24(2)
[Tex. Parks Wildl. Dep., Austin 78744]

79-001280 Radtke, R. L. ABERRANT SAGITTAE FROM LARVAL STRIPED BASS, /MORONE SAXATILIS/. Copeia 1978 (4): 712-713. 28 Dec. 1978. SFA 24(2)
[Belle W. Baruch Inst. Mar. Biol. Coast. Res., Univ. S.C., Columbia 29208]

79-001281 Schlueter, R. A. APPEARANCE AND SUMMER GROWTH OF YOUNG-OF-THE-YEAR /MORONE CHRYSOPS/ AND /ICTALURUS PUNCTATUS/ IN THE LOWER WHITE RIVER, PIKE COUNTY, INDIANA. Proc. Indiana Acad. Sci. 87: 467-468. 1977. SFA 24(2)
[Div. Sci. Math. Univ. Tampa, Tampa, FL] Collections of young-of-the-year white bass, /Morone chrysops/, and channel catfish, /Ictalurus punctatus/, were made approximately every two weeks in the summer of 1974 in the White River. Young-of-the-Year white bass were first collected on June 23. Spawning apparently occurred in late May or early June. Summer growth can be expressed by the regression line: $v = 16.37 + 0.48x$; $r = 0.96$. Young-of-the-year channel catfish were first collected on August 3. Spawning apparently occurred in July. Summer growth can be expressed by the regression line: $y = 26.84 + 0.58x$; $r = 0.56$.

79-001282 Steinbach, D. W.; Noble, R. L. FIRST-YEAR GROWTH OF NORTHERN AND FLORIDA LARGEMOUTH BASS IN A CENTRAL TEXAS POND. Annu. Proc. Tex. Chap. Am. Fish. Soc. 1: 58-66. 1979[1978]. SFA 24(2)
[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77843] An evaluation of the growth rate of Florida (/Micropterus salmoides floridanus/) and northern largemouth bass (/Micropterus salmoides salmoides/) was made in a 0.44 ha pond. In May 1975, 100 fingerlings of each subspecies were stocked. The pond was periodically sampled by electrofishing and was rotenoned in September 1976, to determine final growth attained. The northern largemouth consistently exceeded the Florida largemouth bass in size. At the end of the study, the northern largemouth bass exceeded the Florida bass by 42 mm in length and 313 g in weight. The northern bass spawned, but no evidence of Florida bass spawning was found.

79-001283 Titmus, G.; Claridge, P. N.; Potter, I. C. GROWTH AND ABUNDANCE OF 0-GROUP HERRINGS, /CLUPEA HARENGUS/ L., IN THE SEVERN ESTUARY. Zool. J. Linn. Soc. 64 (3): 251-260. Nov. 1978. SFA 24(2)
[Dep. Biol., Univ. Keele, Keele, Staffs. ST5 5BG, England]
Collections made from the cooling water intake screens of Power Stations in the Severn Estuary and the Bristol Channel have been used to investigate the biology of 0-group herrings in this region. The abundance of herrings at Oldbury, the principal sampling site, was low in most years and in five successive seasons between July 1972 and December 1976, large numbers were caught only between the summer of 1975 and the spring of 1976. The herrings were first observed in July, when many had still not completed metamorphosis, and reached peak numbers in September and October during which period they were clearly growing. Numbers declined in December before rising dramatically in January at which time the length-frequency curves displayed a pronounced bimodality. On the basis of data from other parts of the Bristol Channel and Severn Estuary, it is suggested that this bimodality is due to the influx of some animals from other regions where the growth rate was greater. Although movement is apparently taking place at this time and the numbers decline markedly in subsequent months, the last remnants of the population do not leave the estuary until early May. Post-pelvic scute (K(2)) and vertebra counts (VS) of 13.82 and 55.24 respectively, indicate that the Severn Estuary herrings are the product of a spring spawning stock, a view entirely consistent with length and field data.

79-001284 Tsimenidis, N. [PRELIMINARY REPORT ON AGE AND GROWTH OF THE CARP IN VISTONIS LAKE, GREECE.] Thalassographica 1 (1): 53-63. Oct. 1976. In Greek with English summ. SFA 24(2)

79-001285 Tsimenidis, N.; Papaconstantinou, C.; Ntaoulas, Ch. [AGE AND GROWTH STUDIES OF THE HAKE (/MERLUCCIUS MERLUCCIUS/ L.) IN THE SARONIKOS AND THERMAIKOS GULF.] Thalassographica 2 (1): 27-56. Mar. 1978. In Greek with English summ. SFA 24(2)

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC.

79-001286 Able, K. W. ICHTHYOPLANKTON OF THE ST. LAWRENCE ESTUARY: COMPOSITION, DISTRIBUTION, AND ABUNDANCE. J. Fish. Res. Board Can. 35 (12): 1518-1531. Dec. 1978. In English with French summ. SFA 24(2)
[Dep. Zool., Rutgers Univ., New Brunswick, NJ 08903]

79-001287 Bich, J. P.; Scalet, C. G. FISHES OF THE LITTLE MISSOURI RIVER, SOUTH DAKOTA. Proc. S.D. Acad. Sci. 56: 163-177. 1977. SFA 24(2)
[Dep. Wildl. Fish. Sci., S. Dak. State Univ., Brookings 57006]

79-001288 Boschung, H. THE SHARKS OF THE GULF OF MEXICO, EXCLUSIVE OF THE SMALL BENTHIC SPECIES. Ala. Mus. Nat. Hist. Nat. Notebook No. 4. 16p. Oct. 1978. SFA 24(2)
[Ala. Mus. Nat. Hist., Univ. Ala., University]

79-001289 Boschung, H. , (ed.) ENDANGERED AND THREATENED PLANTS AND ANIMALS OF ALABAMA. Bull. Ala. Mus. Nat. Hist. No.2. 92p. 15 Oct. 1976. SFA 24(2)
[Ala. Mus. Nat. Hist., Univ. Ala., Box 5897, University 35486]

79-001290 Bruton, M. N. FIRST RECORD OF /SAROTHERODON PLACIDUS/ (PISCES: CICHLIDAE) FROM SOUTH AFRICA. Lammergeyer No. 22. p. 33-36. Oct. 1975. SFA 24(2)

79-001291 Cashner, R. C.; Grady, J. M.; Pezold, F. L. A RECENT RECORD FOR THE FRECKLED DARTER, /PERCINA LENTICULA/ RICHARDS AND KNAPP, FROM THE STRONG RIVER, MISSISSIPPI. Proc. La. Acad. Sci. 41: 9-10. 1978. SFA 24(2)
[Dep. Biol. Sci., Univ. New Orleans, New Orleans, LA 70122]

79-001292 Courtenay, W. R., Jr. ADDITIONAL RANGE EXPANSION IN FLORIDA OF THE INTRODUCED WALKING CATFISH. Environ. Conserv. 5 (4): 273-275. 1978. SFA 24(2)
[Dep. Biol. Sci., Fla. Atl. Univ., Boca Raton 33431]

79-001293 Crossman, E. J. QUETICO FISHES. R. Ont. Mus. Life Sci. Misc. Publ. ix + 86p. 1976. SFA 24(2)
[Royal Ontario Mus., 100 Queen's Park, Toronto, ON, Canada]

79-001294 Cruz, C. A. G. SOBRE /CYNOLEBIAS AUREOGUTTATUS/ MYERS, 1952. (/OSTEICHTHYES, CYPRINODONTIDAE, RIVULINAE/). [ON /CYNOLEBIAS AUREOGUTTATUS/ MYERS, 1952. (/OSTEICHTHYES, CYPRINODONTIDAE, RIVULINAE/).] Arq. Univ. Fed. Rural Rio de Janeiro 4 (2): 19-21. 1974. In Portuguese with English summ. SFA 24(2)
[Dep. Biol. Anim., Inst. Biol., Univ. Fed. Rural Rio de Janeiro, Brazil]

79-001295 Curry, K. D.; Spacie, A. DISTRIBUTION OF STREAM FISHES IN TIPPECANOE COUNTY, INDIANA. Proc. Indiana Acad. Sci. 87: 182-188. 1977. SFA 24(2)
[Dep. For. Nat. Resour., Purdue Univ., West Lafayette, IN 47907]

79-001296 Horwitz, R. J. TEMPORAL VARIABILITY PATTERNS AND THE DISTRIBUTIONAL PATTERNS OF STREAM FISHES. Ecol. Monogr. 48 (3): 307-321. 1978. SFA 24(2)
[Div. Limnol. Ecol., Acad. Nat. Sci., Philadelphia, PA 19103]

79-001297 Hubbs, C.; Lucier, T.; Garrett, G. P.; Edwards, R. J.; Dean, S. M.; Marsh, E.; Pelk, D. SURVIVAL AND ABUNDANCE OF INTRODUCED FISHES NEAR SAN ANTONIO, TEXAS. Tex. J. Sci. 30 (4): 369-376. Dec. 1978. SFA 24(2)
[Dep. Zool., Univ. Tex., Austin 78712] Introduced fishes comprise a substantial fraction of the fish fauna in 2 Bexar County waters: 35 percent in upper San Antonio River and 43 percent in Braunig Reservoir. Four species (/Astyanax mexicanus/, /Poecilia latipinna/, /P. formosa/, and /Chichlasoma cyanoguttatum/) are south Texas fishes displaced northward. Two species (/Cyprinodon variegatus/ and /Menidia beryllina/) are recent introductions from estuarine waters. Four species (/Hypostomus plecostomus/, /Poecilia reticulata/,

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/Sarotherodon mossambicus/ and /S. aureus/) are exotics from South America, the Lesser Antilles, Africa, and Israel respectively. Although /P. reticulata/ is now added to the Texas fish fauna the apparent disappearance of another exotic, /Belonesox belezanus/, leaves the number of exotic poeciliids in Texas unchanged. The abundance of exotics is of substantial concern and care should be exercised to reduce the possibility of additional escapes.

79-001298 Kott, E.; Jenkins, R. E.; Humphreys, G. RECENT COLLECTIONS OF THE BLACK REDHORSE, /MOXOSTOMA DUQUESNEI/, FROM ONTARIO. Can. Field-Nat. 93 (1): 63-66. Jan.-Mar. 1979. SFA 24(2)
[Dep. Biol., Wilfrid Laurier Univ., Waterloo, ON N2L 3C5, Canada]

79-001299 Kott, E. A REPORT OF THE BLUEBACK HERRING (/ALOSA AESTIVALIS/) FROM PRINCE EDWARD ISLAND. Nat. Can. (Que.) 105 (4): 295-296. July-Aug. 1978. In English with French summ. SFA 24(2)
[Dep. Biol., Wilfrid Laurier Univ., Waterloo, ON, Canada] The blueback herring (/Alosa aestivalis/) is recorded from Prince Edward Island. This is the first report of this species from the Gulf of St. Lawrence. These specimens are compared with the similar alewife (/Alosa pseudoharengus/).

79-001300 Legasto, R. M.; Del Mundo, C. M. ON THE HYDRO-BIOLOGICAL SURVEY OF SORSOGON BAY FOR THE PROPOSED FISH NURSERIES/RESERVATIONS Philipp. J. Fish. 14 (1): 23-56. Jan.-June 1976. [SFA 24(2)

79-001301 Legendre, P.; Beauvais, A. NICHES ET ASSOCIATIONS DE POISSONS DES LACS DE LA RADISSONIE QUEBECOISE. [NICHES AND ASSOCIATIONS OF FISH OF QUEBEC'S RADISSONIE.] Nat. Can. (Que.) 105 (3): 137-158. May-June 1978. In French with English summ. SFA 24(2)
[Cent. Rech. Sci. Environ., Univ. Quebec, C.P. 8888 Montreal, PQ H3C 3P8, Canada] Fishing data from 378 sites, from lakes in northwestern Quebec, were compared to environmental descriptors through contingency table analyses and partial correlation coefficients, in order to establish the distribution and the niche of the main fish species in those lakes. On the other hand, a probabilistic measure of species co-occurrence, followed by complete linkage clustering, made it possible to describe five associations of species, four of which are amenable to ecological interpretation. Finally, measures of eveness (equitability) of the frequency distribution of species at the various sites show a gradient between the low land area nearer James Bay, where biological activity is higher, and the inland plateaus which represent a more stable and less productive environment.

79-001302 Lubbock, R.; Randall, J. E. FISHES OF THE GENUS /LIOPROPOMA/ (TELEOSTEI: SERRANIDAE) IN THE RED SEA. Zool. J. Linn. Soc. 64 (3): 187-195. Nov. 1978. SFA 24(2)
[Zool. Lab., Univ. Cambridge, Downing Street, Cambridge CB2 3EJ, England] The serranid fish genus /Liopropoma/ is represented in the Red Sea by two previously unrecorded species, the wide-ranging /L. susumi/ (Jordan & Seale) and /L. mitratum/ sp. nov. /Liopropoma mitratum/ is known only from the Red Sea, and is overall reddish-pink in life with mustard yellow stripes on the head.

79-001303 Matsumoto, W. M. DISTRIBUTION, RELATIVE ABUNDANCE, AND MOVEMENT OF SKIPJACK TUNA, /KATSUWONUS PELAMIS/, IN THE PACIFIC OCEAN BASED ON JAPANESE TUNA LONGLINE CATCHES, 1964-67. NOAA Tech. Rep. NMFS SSRF- 695. iii + 30p. Oct. 1975. SFA 24(2)

79-001304 Matthews, F. D.; Cincotta, D. A.; Hocutt, C. H.; Stauffer, J. R., Jr. CHECKLIST OF THE FISHES AND MACROINVERTEBRATES OF CONOCOCHEAGUE CREEK, PENNSYLVANIA AND MARYLAND. Proc. Pa. Acad. Sci. 52 (1): 60-66. 1978. SFA 24(2)
[Dep. Zool., Univ. Md., College Park 20742]

79-001305 McGregor Reid, G.; Sydenham, H. A CHECKLIST OF LOWER BENUE RIVER FISHES AND AN ICHTHYOGEOGRAPHICAL REVIEW OF THE BENUE RIVER (WEST AFRICA). J. Nat. Hist. 13 (1): 41-67. Jan.-Feb. 1979. SFA 24(2)
[Biol. Dep., Queen Elizabeth Coll., London Univ., England]

79-001306 McReynolds, H. F. A DISTRIBUTION STUDY OF THE BLACKTAIL SHINER (/NOTROPIS VENUSTUS/) IN THE CLEAR CREEK BASIN. Proc. Indiana Acad. Sci. 87: 432. 1977. Abstract only. SFA 24(2)
[U.S. For. Serv., Bedford, IN]

79-001307 McReynolds, H. F.; Janisch, J. L. RECENT FISH COLLECTIONS FROM BLUE RIVER, WASHINGTON COUNTY, INDIANA. Proc. Indiana Acad. Sci. 87: 238-241. 1977. SFA 24(2)
[U.S. For. Serv., Bedford, IN 47421]

79-001308 Milstein, C. B.; Thomas, D. L.; Garlo, E. V.; Swiecicki, F. A.; Swiecicki, D. P.; Burns, F. A.; Howells, R. G.; Danila, D. J.; Bieder, R. C.; Beckler, R. J.; Saffian, N. A.; Prendergast, P. A.; Hamer, D. P.; Tatham, T. R.; Brangenberg, W. C. SUMMARY OF ECOLOGICAL STUDIES FOR 1972-1975 IN THE BAYS AND OTHER WATERWAYS NEAR LITTLE EGG INLET AND IN THE OCEAN IN THE VICINITY OF THE PROPOSED SITE FOR THE ATLANTIC GENERATING STATION, NEW JERSEY. Ichthyol. Assoc. Inc. Bull. No. 18. xxxiii + 757p. Dec. 1977. SFA 24(2)
[Ichthyol. Assoc., Inc., Box 70-D, R.D. 2, Absecon, NJ 08201]

79-001309 Papaconstantinou, C.; Tsimenidis, N.; Daulas, Ch. A NEW RECORD OF A BATHYPELAGIC FISH /BELLOTTIA APODA/ GIGL., 1883, IN SARONIKOS GULF (GREECE) (PISCES, PERCIFORMES). Thalassographica 1 (2): 279-287. Dec. 1977. In English with Greek summ. SFA 24(2)
[Inst. Oceanogr. Fish. Res., Athens, Greece]

79-001310 Peterka, J. J. FISHES AND FISHERIES OF THE SHEYENNE RIVER, NORTH DAKOTA. Proc. N.D. Acad. Sci. 32 (2): 29-44. Dec. 1978. SFA 24(2)
[Dep. Zool., N. Dak. State Univ., Fargo 58102]

79-001311 Richards, W. J.; Saksena, V. P. NOTES ON THE DISTRIBUTION OF GURNARD FISHES (GENUS /LEPIDOTRIGLA/, FAMILY TRIGLIDAE) OFF THE NORTHWEST COAST OF AFRICA. Bull. Mar. Sci. 28 (4): 792-794. Oct. 1978. SFA 24(2)
[NMFS, 75 Virginia Beach Dr., Miami, FL 331491

79-001312 Riehl, R. ZUR FISCHFAUNA VON IBIZA, BALEAREN (PISCES). [THE FISH FAUNA OF IBIZA, BALEARES (PISCES).] Senckenb. Biol. 59 (3/4): 173-182. 19 Oct. 1978. In German with English summ. SFA 24(2)
[Inst. Allg. Spez. Zool., Stephanstrasse 24, D-6300 Giessen, West Germany]

79-001313 Robison, H. W.; Winters, S. OCCURRENCE OF THE SLENDER MADTON, /NOTURUS EXILIS/ NELSON (OSTEICHTHYES: ICTALURIDAE), IN THE LITTLE RIVER SYSTEM, ARKANSAS. Southwest. Nat. 23 (4): 688-689. 28 Dec. 1978. SFA 24(2)
[Dep. Biol. Sci., South Ark. Univ., Magnolia 71753]

79-001314 Ryan, P. A. THE FISH OF LAKE ELLESMERE, CANTERBURY. Mauri Ora 2: 131-136. 1974. SFA 24(2)
[Dep. Zool., Univ. Canterbury, Christchurch, New Zealand]

79-001315 Shen, S.-C.; Choi, Y.-H. ECOLOGICAL AND MORPHOLOGICAL STUDY ON FISH-FAUNA FROM THE WATERS AROUND TAIWAN AND ITS ADJACENT ISLANDS. 16. STUDY ON THE LABRID FISHES (LABRIDAE). Rep. Inst. Fish. Biol. Minist. Econ. Aff. Natl. Taiwan Univ. 3 (2): 67-106. July 1976. SFA 24(2)
[Dep. Zool., Natl. Taiwan Univ., Taipei 107, Taiwan] The family of Labridae is reviewed from Taiwan and its adjacent islands. Ninety-six species, including three doubtful species, belonging to twenty-eight genera and four subfamilies are recognized. Most species are studied and compared by using living, fresh or preserved specimens to present information on certain difficult-to-indentify species and also to give a key of species (including their primary, terminal and sexually dichromatic color phases, if any), genera and subfamilies currently recognized.

79-001316 Toureng, J. N.; Dauba, F. TRANSFORMATION DE LA FAUNE DES POISSONS DANS LA RIVIERE LOT. [CHANGES IN THE SPECIES COMPOSITION OF FISH IN THE RIVER LOT.] Ann. Limnol. 14 (1-2): 133-138. 1978. In French with English summ. SFA 24(2)
[Lab. Hydrobiol. (ERA 702), Univ. Paul-Sabatier, 118, rt. Narbonne, 31077 Toulouse Cedex, France] The disturbances in the river caused by the construction of large reservoirs in the upper Lot and its tributary the Truyere have modified the distribution of the principal fish species, particulary in the barbel zone. However the overall distribution of fish species in the river remains normal and downstream the distribution is characteristic of a lowland river with abundant fish.

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ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY

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The relationship between abundances of bank cover and trout was examined in the Pigeon and Salmon Trout Rivers. Trout populations were inventoried by mark-and-recapture electrofishing in July and October, 1976. During 1976 summer low flow, length of stream bank providing overhead concealment for trout was measured in numerous 100-m reference stations on both streams. Overhead bank cover included all submerged undercut banks, overhanging vegetation, and log cover not closer than 15cm to the stream bed and forming overhangs at least 9cm wide. In the Pigeon River, abundance of overhead bank cover accounted for 38-88 percent of variation in July and October abundance indices of brook and brown trout ≥150mm. In the Salmon Trout River, abundance of overhead bank cover explained 29-93 percent of variation in July and October abundance indices of brook trout ≥150mm. Bank cover appeared to be the major factor limiting trout populations in both streams, despite differences in fish species composition, water hardness, and hydrologic characteristics.

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[Dep. Fish. Wildl. Biol., Colo. State Univ., Fort Collins 80523]
Recent discoveries of native cutthroat trout populations in desert mountain ranges on the western fringe of the Bonneville Basin have prompted intensified management efforts by state and federal agencies. Analysis of Snake Valley cutthroat specimens in Trout Creek, Deep Creek Mountain Range, Utah, indicate this is a pure strain of trout which once inhabited Pleistocene Lake Bonneville and which was thought to be extinct in Utah. The Snake Valley cutthroat is similar to /Salmo

79-001336 CONTINUED
clarki utah/ of the eastern Bonneville Basin; however, electrophoretic and morphomeristic analysis show unique genetic differences brought about by long-term isolation (8,000 years) from the remainder of the Bonneville Basin cutthroat. This cutthroat is a common ancestor to several other limited cutthroat populations within the basin in Nevada. In May 1977 the BLM withdrew from mineral entry about 27,000 acres within the Deep Creek Mountains for protection of this salmonid cutthroat and other unique resources on the range. Results of 1977 stream surveys on the Pilot Peak Mountain Range, Utah, indicate the presence of the threatened Lahontan cutthroat, /Salmo clarki henshawi/, in one isolated stream.

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A systematic study of the Bonneville cutthroat trout /Salmo clarki utah/, was initiated to determine its taxonomic status and affinities with other cutthroat trout. Only one trout, /S. c. utah/, is endemic to the Bonneville basin, the largest endorheic basin in the Great Basin of western North America. /S. c. utah/, historically abundant throughout all suitable habitat of a vast area of Utah, Wyoming, Nevada and Idaho, suffered a catastrophic decline from massive introduction of non-native trouts and habitat alteration and degradation to a point of virtual extinction as pure populations. Today only 14 populations from primarily small headwater streams and one lake population of pure /S. c. utah/ are known. Historical and zoogeographic evidence and information pertaining to Lake Bonneville and the decline of /S. c. utah/ since its desiccation was compiled and analyzed. Samples of fish were collected and traditional mensural meristic characters were recorded. Modified Hubbs and Hubbs diagrams of pure /S. c. utah/ populations and pure populations of other subspecies of /S. clarki/ and of /S. gairdneri/ were used to display the results of the meristic data in more graphic manner. A computer program, multiple discriminant function analysis, was used to compare the evolutionary affinities of /S. c. utah/ with other subspecies of /S. clarki/ and with /S. gairdneri/. The results show that /S. c. utah/ is differentiated from the other trout used in this study, according to the 16 morphomeristic characters used in the program. The computer results substantiated and statistically verified the results of other morphomeristic analysis documenting the separation of /S. c. utah/ from various subspecies of /S. clarki/. Management goals needed to save and enhance the remnant populations of Bonneville cutthroat trout are discussed. Sufficient information is presented in this study to warrant protective recognition for the few remaining populations of /S. c. utah/.

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PARASITES AND DISEASES-GENERAL

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[NMFS, Sandy Hook Lab., Highlands, NJ 07732]

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[Cent. Res. Adv. Study, Univ. Me., Portland-Gorham 041021]

79-001378 Snieszko, S. F. BACTERIAL DISEASES OF FISHES AND THEIR CONTROL. Mar. Fish. Rev. 40 (10): 2-3. Oct. 1978. SFA 24(2)
[U.S. FWS, Natl. Fish Health Res. Lab., Kearneysville, WV 25430]

79-001379 Udey, L. R. ANAEROBIC BACTERIA AS POSSIBLE DISEASE AGENTS IN FISH. Mar. Fish. Rev. 40 (10): 10-12. Oct. 1978. SFA 24(2)
[Dep. Microbiol., Univ. Miami Sch. Med., Miami, FL 33152]

79-001380 Walters, G. R.; Plumb, J. A. MODIFIED OXIDATION/FERMENTATION MEDIUM FOR USE IN IDENTIFICATION OF BACTERIAL FISH PATHOGENS. J. Fish. Res. Board Can. 35 (12): 1629-1630. Dec. 1978. In English with French summ. SFA 24(2)
[2 Ramsgate Ct., York, PA 17404]

PROTOZOAN DISEASES

79-001381 Becker, C. D. FLAGELLATE PARASITES OF FISH. In Parasitic Protoza, Vol. 1., Academic Press, Inc. p. 357-416. 1977. SFA 24(2)
[Battelle Memorial Inst., Pac. Northwest Lab., Richland, WA 99352]

79-001382 Horwath, L.; Lang, M.; Tamas, G. THE USE OF COPPEROXYCHLORIDE DURING LARVAL GROWTH AS A PREVENTATIVE MEASURE AGAINST THE SPREAD OF CILIATAEXOPARASITES. Bamidgeh 30 (3): 80-84. Sept. 1978. SFA 24(2)
[Warmwater Fish Hatchery, Szazhalombatta, Hungary] During culture of larvae and fry, the danger of infection with exoparasitic Ciliates (/Trichodina/, /Chilodonella/) increases in correlation to intensification of production. The main damage incurred does not appear as loss - although this may also occur - but rather as restricted growth and poor quality. Some copper compounds seemed likely candidates for prevention of parasite evoked damage to farmed larvae and fry of cyprinid fish (carp, silver-carp, grass-carp, and tench). Instead of the well known and effective but at the same time poisonous copper sulfate, we used the less toxic copperoxychloride. Before treatment of ponds, concentrations effective against parasites were determined under laboratory conditions. The therapeutic dose proved to be 4 mg/l; only twenty fold concentrations (i.e. 80 mg/l) were toxic to the fish. In pond treatments parasites were eliminated

79-001382 CONTINUED
by copper compound at a concentration of 4 mg/l. When changes in technology were also instituted, fish developed well and there was no renewal of infection.--summ.

79-001383 Munday, B. L.; Hartley, W. J.; Harrigan, K. E.; Presidente, P J. A.; Obendorf, D. L. /SARCOCYSTIS/ AND RELATED ORGANISMS IN AUSTRALIAN WILDLIFE: II. SURVEY FINDINGS IN BIRDS, REPTILES, AMPHIBIANS AND FISH. J. Wildl. Dis. 15 (1): 57-73. Jan. 1979. SFA 24(2)
[Mt. Pleasant Lab., P.O. Box 46, Launceston South, Tasmania, Australia]

79-001384 O'Grodnick, J. SUSCEPTIBILITY STUDIES OF VARIOUS SALMONIDS TO WHIRLING DISEASE: HISTOLOGICAL STAINING AND SPORE CONCENTRATION PROCEDURES. Mar. Fish. Rev. 40 (10): 30-31. Oct. 1978. SFA 24(2)
[Benner Spring Fish Res. Stn., Bellefonte, PA 16823]

79-001385 Wolf, K.; Markiw, M. E. /MYXOSOMA CEREBRALIS/: A METHOD FOR STAINING SPORES AND OTHER STAGES WITH SILVER NITRATE. J. Fish. Res. Board Can. 36 (1): 88-89. Jan. 1979. In English with French summ. SFA 24(2)
[U.S. FWS, Natl. Fish Health Res. Lab., Kearneysville, WV 25430]

VIRAL DISEASES

79-001386 Buynak, G. L.; Gurzynski, A. J. LYMPHOCYSTIS DISEASE IN WALLEYE (/STIZOSTEDION VITREUM/) CAPTURED IN THE SUSQUEHANNA RIVER. Proc. Pa. Acad. Sci. 52 (1): 49-50. 1978. SFA 24(2)
[Ichthyological Assoc., Inc., R.D. 1, Berwick, PA 18603] Seasonal variation in the incidence of lymphocystis tumors in 272 walleye, /Stizostedion vitreum/, from the Susquehanna River was investigated in 1975 and 1976. The incidence of infection was significantly higher (P less than 0.01) during the winter and the highest incidence (31 percent) occurred in February. Most tumors (53 percent) were on the body below the spinous dorsal fin. Lymphocystis did not occur in fish younger than three years old.

79-001387 Hetrick, F. M.; Knittel, M. D.; Fryer, J. L. INCREASED SUSCEPTIBILITY OF RAINBOW TROUT TO INFECTIOUS HEMATOPOIETIC NECROSIS VIRUS AFTER EXPOSURE TO COPPER. Appl. Environ. Microbiol. 37 (2): 198-201. Feb. 1979. SFA 24(2)
[Dep. Microbiol., Univ. Md., College Park 20740] Exposure of rainbow trout to sublethal levels of copper in water increased their susceptibility to infectious hematopoietic necrosis virus. In most instances, the percent mortality was twice as great in the stressed groups compared with those groups which were not stressed but received the same virus dose. Although the level of copper in the water influenced the mortality rates, the length of exposure did not prove to be critical, as similar results were obtained after 1, 3, 5, 7, or 9 days of exposure. When different virus challenges were employed, the percent mortalities were again greater in the stressed fish at all virus doses tested, and at one dose level mortalities were noted in the stressed group but not in the untreated group.

79-001388 Koment, R. W. PHOSPHONOACETIC ACID INHIBITION OF CHANNEL CATFISH VIRUS REPLICATION. Mar. Fish. Rev. 40 (10): 24-25. Oct. 1978. SFA 24(2)
[Dep. Dermatol., Univ. Miami Sch. Med., Miami, FL 33152]

79-001389 McAllister, P. E. VIRUSES AND VIRUS DISEASES OF SALMONID FISHES. Mar. Fish. Rev. 40 (10): 21-23. Oct. 1978. SFA 24(2)
[U.S. FWS, Natl. Fish Health Res. Lab., Kearneysville, WV 25430]

79-001390 Plumb, J. A.; Bowser, P. R. RECENT DEVELOPMENTS IN CHANNEL CATFISH VIRUS RESEARCH. Mar. Fish. Rev. 40 (10): 12-13. Oct. 1978. SFA 24(2)
[Dep. Fish. Allied Aquacult., Auburn Univ., Auburn, AL 36830]

79-001391 Reno, P.; Philippon-Fried, M.; Nicholson, B. L.; Sherburne, S. PISCINE ERYTHROCYTIC NECROSIS (PEN): A VIRAL INFECTION OF THE ATLANTIC COD AND OTHER MARINE FISHES. Mar. Fish. Rev. 40 (10): 16-18. Oct. 1978. SFA 24(2)
[Dep. Microbiol., Univ. Me., Orono 04473]

OTHER DISEASES AND PARASITES

79-001392 Becker, C. D.; Dauble, D. D. RECORDS OF PISCIVOROUS LEECHES (HIRUNDINEA) FROM THE CENTRAL COLUMBIA RIVER, WASHINGTON STATE. NOAA Fish. Bull. 76 (4): 926-931. 1979. SFA 24(2)
[Ecosystem Dep., Battelle, Pac. Northwest Lab., Richland, WA 99352]

79-001393 Chung, H.-Y.; Kou, G.-H. A SPONTANEOUS EPITHELIOMA IN THE COLOR CARP (/CYPRINUS CARPIO/ L.). Rep. Inst. Fish. Biol. Minist. Econ. Aff. Natl. Taiwan Univ. 3 (2): 1-3. July 1976. SFA 24(2)
[Dep. Zool., Coll. Sci., Natl. Taiwan Univ., Taipei, Taiwan] A spontaneous, malignant, non-metastatic epithelioma (epidermoid carcinoma) was found in the head region of a color carp, /Cyprinus carpio/ L. The tumor was similar in many respects to that of the skin epitheliomas of mammals and other vertebrates. This is the first case found in fish belonging to /Cyprinus carpio/ L.--summ.

79-001394 Deutsch, W. G. /LERNAEA CYPRINACEA/ ON TWO CATOSTOMID FISHES. Proc. Pa. Acad. Sci. 52 (1): 57-59. 1978. SFA 24(2)
[Ichthyological Assoc., Inc., R.D. , Berwick, PA 18603] The parasitic copepod, /Lernaea cyprinacea/, occurred on 66 percent of white sucker (/Catostomus commersoni/) and 32 percent of quillback (/Carpiodes cyprinus/) collected in the Susquehanna River from June through Novemeber 1973. Number of copepodids was high on both fishes from August through October (in September, 90 percent of white sucker were infected), but declined sharply with river temperature in November. Infection rates of adult copepods were highest in November (64 percent of white sucker, 27 percent of quillback), when parasite reproduction was interrupted. Intensities of copepodids ranged from 1 to 104/host (mean = 10/host) on white sucker and from 1 to 5/host (mean = 2/host) on quillback; those of adult copepods varied from 1 to 28/host (mean = 4/host) on white sucker and from 1 to 2/host (mean = 1/host) on quillback. The gills of white sucker were infected more frequently than the body surface or any fin; only the gills of quillback were infected.

79-001395 Fusco, A. C.; Overstreet, R. M. TWO CAMALLANID NEMATODES FROM RED SEA FISHES INCLUDING /PROCAMALLANUS ELATENSIS/ SP. NOV. FROM SIGANIDS. J. Nat. Hist. 13 (1): 35-40. Jan.-Feb. 1979. SFA 24(2)
[Gulf Coast Res. Lab., Ocean Springs, MS 39564]

79-001396 Ghittino, P. L'ASCITE DELLA CIECA (/ANGUILLA ANGUILLA/) D'ALLEVAMENTO DA DEGENERAZIONE LIPOIDEA EPATICA. [DROPSY IN REARED ELVERS (/ANGUILLA ANGUILLA/) LINKED WITH LIVER LIPOID DEGENERATION.] Riv. It. Piscic. Ittiop. 13 (4): 97-100. Oct.-Nov.-Dec. 1978. In Italian with English summ. SFA 24(2)
[Fish Dis. Lab., Ist. Zoopr. Sper. Piem. Lig., Via Bologna 148, 10154 Torino, Italy] The author describes a case report of dropsy in European elvers (/Anguilla anguilla/) reared in an Italian intensive eel farm supplied with heated water. A similiar pathological condition has been reported in /Anguilla japonica/ by Japanese authors under the name of "serious dropsy in eel". According to the author, the abdominal serous collection seems to be linked with a Liver Lipoid Degeneration (LLD). In fact, the histopathological examination demonstrates fatty and ceroid accumulations in liver cells. Such LLD should induce an obstacle in blood stream resulting in serous transudate in the coelomic cavity of the elver. The author advises that the condition may be linked with noxious dietetic factors, broadly speaking. The histologically observed accumulation of /Myxidium giardi/ in liver should be considered as fortuitous.

79-001397 Hauck, A. K. OCCURRENCE AND SURVIVAL OF THE LARVAL NEMATODE /ANISAKIS/ SP. IN THE FLESH OF FRESH, FROZEN, BRINED, AND SMOKED PACIFIC HERRING, /CLUPEA HARENGUS PALLASI/. J. Parasitol. 63 (3): 515-519. June 1977. SFA 24(2)
[Fish. Pathol. Lab., Alaska Dep. Fish Game, Anchorage 99502]

79-001398 Holloway, H. L., Jr.; Smith, C. E. MUSCULAR NECROSIS OF /STIZOSTEDION VITREUM/ IN NORTH DAKOTA. Am. Zool. 18 (3): 611. 1978. Abstract only. SFA 24(2)
[Univ. N. Dak., Grand Forks]

79-001399 Jensen, L. A.; Heckmann, R. A. /ANANTRUM HISTOCEPHALUM/ SP. N. (CESTODA: BOTHRIOCEPHALIDAE) FROM /SYNODUS LUCIOCEPS/ (SYNODONTIDAE) OF SOUTHERN CALIFORNIA. J. Parasitol. 63 (3): 471-472. June 1977. SFA 24(2)
[17639 Clymer St., Granada Hills, CA 91344]

79-001400 Jilek, R.; Price, R. /BOTHRIOCEPHALUS CUSPIDATUS/ COOPER, 1917 (CESTODA: BOTHRIOCEPHALIDAE) IN /DOROSOMA CEPEDIANUM/ FROM TWO ILLINOIS LAKES. Can. J. Zool. 56 (11): 2456-2457. Nov. 1978. SFA 24(2)
[Dep. Zool., Ohio State Univ., Columbus]

79-001401 Johnsen, B. O. THE EFFECT OF AN ATTACK BY THE PARASITE /GYRODACTYLUS SALARIS/ ON THE POPULATION OF SALMON PARR IN THE RIVER LAKSELVA, MISVAER IN NORTHERN NORWAY. Astarte 11 (1): 7-9. 1978. SFA 24(2)

[Div. Wildl. Freshwater Fish, Elgesetergt. 10, N-7000 Trondheim, Norway] A severe attack by the host specific parasitic flatworm, /Gyrodactylus salaris/ on juvenile salmon (/Salmo salar/ L.), was first observed in the river Lakselva in Misvaer county in Northern Norway. The first few /Gyrodactylus/ infected salmon parr were found in August 1975. One year later, in August 1976, almost all salmon parr sampled at five stations were infected. Because of heavy mortality among the salmon parr caused by the /gyrodactylus/ attack almost all salmon parr had disappeared from the river by the time of August 1977. No trout infected by /Gyrodactylus/ was found, and the number of trout parr caught each year remained within expected annual variation. /Gyrodactylus/ is a typical "weakness-parasite" and heavy algal growth in the river, making the environment unfavorable in one way or another is supposed to be the indirect cause of the /Gyrodactylus/ attack on the salmon parr.

79-001402 Jones, J. B.; Hine, P. M. A NEW SPECIES OF /MUGILICOLA/ PARASITIC ON SOUTH AFRICAN ELVERS (COPEPODA, THERODAMASIDAE). Zool. Afr. 13 (2): 213-219. 1978. SFA 24(2)

[Fish. Res. Div., Minist. Agric. Fish., Box 19-062, Wellington, New Zealand]

79-001403 Kawatsu, H. STUDIES ON THE ANEMIA OF FISH. IX. HYPOCHROMIC MICROCYTIC ANEMIA OF CRUCIAN CARP CAUSED BY INFESTATION WITH A TREMATODE, /DIPLOZOON NIPPONICUM/. Bull. Jpn. Soc. Sci. Fish. 44 (12): 1315-1319. Dec. 1978. SFA 24(2)

[Freshwater Fish. Res. Lab., Miya, Hino-shi, Tokyo, Japan] Hypochromic microcytic anemia of crucian carp due to infestation with a trematode, /Diplozoon nipponicum/, was studied. Host fish were obtained from the river Asakawa. Investigations were carried out four times during the period from October 1975 to September 1976. A high incidence of infestation with this parasite was noted in all samples. Infection ranged between 60 and 80 percent in small fish, and in larger fish the level reached 100 percent. The hemoglobin levels of the host fish decreased with increasing numbers of parasites and the relationships between them appeared approximately linear. In anemic fish, all hematological indices decreased. Thus, the anemia was categorized as a hypochromic microcytic anemia. The anemia was categorized as a hypochromic microcytic anemia. The anemia was characterized by a high percentage of immature erythrocytes. Exposure to a concentration of 1.0 ppm of Trichlorfon (DEP) for 48 hrs proved to be highly effective in eliminating this parasite.

79-001404 Kearn, G. C. EARLY DEVELOPMENT AND MICROHABITAT OF THE MONOGENEAN /HOPRICAUDA RHINOBATIDIS/, WITH OBSERVATIONS ON THE RELATED /TROGLOCEPHALUS RHINOBATIDIS/, FROM /RHINOBATOS BATILLUM/ FROM QUEENSLAND, AUSTRALIA. Int. J. Parasitol. 8 (4): 305-311. Aug. 1978. SFA 24(2)

[Sch. Biol. Sci., Univ. East Anglia, Norwich NR4 7TJ, England]

79-001405 Kuzia, F. J. STUDIES ON THE LIFE HISTORY, SEASONAL PERIODICITY AND HISTOPATHOLOGY OF /DICHELYNE BULLOCKI/ STROMBERG AND CRITES (NEMATODA:CUCULLANIDAE) A PARASITE OF /FUNDULUS HETEROCLITUS/ (L.). Ph.D. dissertation, Univ. N.H. 104p. 1978. From Diss. Abstr. Int. B Sci. Eng. 39(7):3193. Jan. 1979. SFA 24(2)

79-001406 Madhavi, R. OBSERVATIONS ON THE OCCURRENCE OF /ALLOCREADIUM FACIATUSI/ IN /APLOCHEILUS MELASTIGMA/. J. Fish Biol. 14 (1): 47-58. Jan. 1979. SFA 24(2)
[Dep. Zool., Andhra Univ., Waltair 530003, India]

79-001407 Mayes, M. A.; Brooks, D. R.; Thorson, T. B. TWO NEW SPECIES OF /ACANTHOBOTHRIUM/ VAN BENEDEN 1849 (CESTOIDEA: TETRAPHYLLIDEA) FROM FRESHWATER STINGRAYS IN SOUTH AMERICA. J. Parasitol. 64 (5): 838-841. Oct. 1978. SFA 24(2)
[Dep. Pathobiol., Sch. Vet. Med., Univ. pa., Philadelphia 19104]

79-001408 Moser, M.; Taylor, S. EFFECTS OF THE COPEPOD /CARDIODECTES MEDUSAEUS/ ON THE LATERNFISH /STENOBRACHIUS LEUCOPSARUS/ WITH NOTES ON HYPERCASTRATION BY THE HYDROID /HYDRICHTHYS/ SP. Can. J. Zool. 56 (11): 2372-2376. Nov. 1978. In English with French summ. SFA 24(2)
[Dep. Biol. Sci., Univ. Calif., Santa Barbara 93106]

79-001409 Muzzall, P. M.; Bullock, W. L. SEASONAL OCCURRENCE AND HOST-PARASITE RELATIONSHIPS OF /NEOECHINORHYNCHUS SAGINATUS/ VAN CLEAVE AND BANGHAM 1949 IN THE FALLFISH, /SEMOTILUS CORPORALIS/ (MITCHILL). J. Parasitol. 64 (5): 860-865. Oct. 1978. SFA 24(2)
[Dep. Zool., Univ. N.H., Durham 03824]

79-001410 Nebeker, A. V.; Stevens, D. G.; Baker, R. J. SURVIVAL OF SALMON SMOLTS IN SEA WATER AFTER EXPOSURE TO AIR-SUPERSATURATED WATER. Prog. Fish-Cult. 41 (1): 30-32. Jan. 1979. SFA 24(2)
[U.S. EPA, West. Fish Toxicol. Stn., Corvallis, OR 97330]

79-001411 Ogawa, K.; Egusa, S. /PALIOTREMA KURODAI/ N. SP. (MONOGENEA: DACTYLOGYRIDAE, ANCYROCEPHALINAE), A MONOGEAN PARASITE OBTAINED FROM THE JAPANESE BLACK SEA BREAM, /ACANTHOPAGRUS SCHLEGELI/ (BLEEKER). Bull. Jpn. Soc. Sci. Fish. 44 (12): 1329-1332. Dec. 1978. SFA 24(2)
[Dep. Fish., Fac. Agric., Univ. Tokyo, Japan]

79-001412 Overstreet, R. M. TRYPANORHYNCH INFECTIONS IN THE FLESH OF SCIAENID FISHES. Mar. Fish. Rev. 40 (10): 37-38. Oct. 1978. SFA 24(2)
[Gulf Coast Res. Lab., Ocean Springs, MS 39564]

79-001413 Pal, J.; Pal, B. C.; Bannerjee, R. EPITHELIAL CARCINOMA IN /ANABAS TESTUDINEUS/. J. Fish Biol. 13 (6): 693-694. Dec. 1978. SFA 24(2)
[Cancer Res. Inst., Tata Memorial Cent., Bombay, India]
Histological examination of a skin tumour from /Anabas testudineus/ indicated its carcinogenic nature. Two types of bacteria were islolated from the tumour and adjacent tissue.

79-001414 Palmieri, J. R.; Heckmann, R. A.; Evans, R. S. LIFE HISTORY AND HABITAT ANALYSIS OF THE EYE FLUKE /DIPLOSTOMUM SPATHACEUM/ (TREMATODA: DIPLOSTOMATIDAE) IN UTAH. J. Parasitol. 63 (3): 427-429. June 1977. SFA 24(2)
[Dep. Zool., Brigham Young Univ., Provo, UT 846021]

79-001415 Poston, H. A.; Riis, R. C.; Rumsey, G. L.; Ketola, H. G. NUTRITIONALLY INDUCED CATARACTS IN SALMONIDS FED PURIFIED AND PRACTICAL DIETS. Mar. Fish. Rev. 40 (10): 45-46. Oct. 1978. SFA 24(2)
[Tunison Lab. Fish. Nutr., Cortland, NY 13045]

79-001416 Rid, L. E. HELMINTH PARASITES OF THE LONG-FINNED EEL, /ANGUILLA DIEFFENBACHII/, AND THE SHORT-FINNED EEL, /A. AUSTRALIS/. Mauri Ora 1: 99-106. 1973. SFA 24(2)
[Dep. Zool., Univ. Canterbury, Christchurch, New Zealand]

79-001417 Schmidt, G. D.; Paperna, I. /SCLEROCOLLUM RUBRIMARIS/ GEN. ET SP. N. (RHADINORHYNCHIDAE: GORGORHYNCHINAE), AND OTHER ACANTHOCEPHALA OF MARINE FISHES FROM ISRAEL. J. Parasitol. 64 (5): 846-850. Oct. 1978. SFA 24(2)
[Dep. Biol., Univ. North. Colo., Greeley 80639]

79-001418 Valtonen, E. T.; Valtonen, T. /CYSTIDICOLA FARIONIS/ AS A SWIMBLADDER PARASITE OF THE WHITEFISH IN THE BOTHNIAN BAY. J. Fish Biol. 13 (5): 557-561. Nov. 1978. SFA 24(2)
[Dep. Zool., Univ. Oulu, Finland]

79-001419 van den Broek, W. L. F. THE EFFECTS OF /LERNAEOCERA BRANCHIALIS/ ON THE /MERLANGIUS MERLANGUS/ POPULATION IN THE MEDWAY ESTUARY. J. Fish Biol. 13 (6): 709-715. Dec. 1978. SFA 24(2)
[Fish. Res. Div., P.O. Box 19062, Wellington, New Zealand] Whiting entering estuarine waters during autumn are largely free from the copepod /Lernaeocera branchialis/ (L.). Infection soon follows and, between 1973 and 1975, an average 40.4 percent whiting were infected. The parasite's effects on fish weight over this period are assessed and, in a separate study, its effects on the host's lipid biochemistry determined. Mature adults of /L. branchialis/ caused a significant reduction in body weight. Liver lipid content was also lower in these individuals, by more than 50 percent. Phospholipid levels were lower but cholesterol readings were greater in infected fish. Fatty acid composition of liver lipids appeared unaffected.

79-001420 Vrijenhoek, R. C. GENETIC DIFFERENTIATION AMONG LARVAL NEMATODES INFECTING FISHES. J. Parasitol. 64 (5): 790-798. Oct. 1978. SFA 24(2)
[Dep. Zool., Rutgers Univ., New Brunswick, NJ 08903]

79-001421 Warren, M. L.; Wilson, J. L. PARASITIC NEMATODE /CONTRACAECUM/ IN TWO SUBSPECIES OF LARGEMOUTH BASS. Prog. Fish-Cult. 40 (4): 137. Oct. 1978. SFA 24(2)
[Ky. Nat. Preserves Comm., Frankfort 40601]

79-001422 Wilkinson, C. E. INCIDENCE OF A TREMATODE, /DIPLOPROCTODAEUM PLICITUM/ (LINTON, 1928) IN THE PUFFERFISH, /URANOSTOMA RICHEI/ (FREMINVILLE, 1813). Mauri Ora 1: 141-146. 1973. SFA 24(2)
[Dep. Zool., Univ. Canterbury, Christchurch, New Zealand]

79-001423 Williams, A. D.; Campbell, R. A. /DUPLICIBOTHRIUM MINUTUM/ GEN. ET SP. N. (CESTODA: TETRAPHYLLIDEA) FROM THE COWNOSE RAY, /RHINOPTERA BONASUS/ (MITCHILL 1815). J. Parasitol. 64 (5): 835-837. Oct. 1978. SFA 24(2)
[Dep. Biol., Southeast. Mass. Univ., North Dartmouth 02747]

POLLUTION

79-001424 Basile, B. P. ENVIRONMENTAL EFFECTS OF OFFSHORE OIL PRODUCTION. Ph.D. dissertation, Univ. Houston 289p. 1978. From Diss. Abstr. Int. B Sci. Eng. 39(7):3215. Jan. 1979. SFA 24(2)

79-001425 Courtemanch, D. IMPACT OF CHLORINATED WASTEWATER ON AQUATIC LIFE IN MAINE. Me. Dep. Environ. Prot. 16p. 1 Mar. 1977. SFA 24(2)
[Me. Dep. Environ. Prot., Augusta 04330]

79-001426 Cripe, C. R. AN AUTOMATED DEVICE (AGARS) FOR STUDYING AVOIDANCE OF POLLUTANT GRADIENTS BY AQUATIC ORGANISMS. J. Fish. Res. Board Can. 36 (1): 11-16. Jan. 1979. In English with French summ. SFA 24(2)
[U.S. EPA, Sabine Island, Gulf Breeze, FL 32561]

79-001427 Davis, D. M.; Morgan, D. W. FISH COMMUNITIES IN THE VICINITY OF THE MICHIGAN CITY GENERATING STATION--PRELIMINARY RESULTS Proc. Indiana Acad. Sci. 87: 171. 1977. Abstract only. SFA 24(2)

79-001428 Diachenko, G. W. DETERMINATION OF SEVERAL INDUSTRIAL AROMATIC AMINES IN FISH. Environ. Sci. Technol. 13 (3): 329-333. Mar. 1979. SFA 24(2)
[Dev. Chem. Technol., Food Drug Admin., Washington, DC 20204]

79-001429 Eagle, R. A.; Norton, M. G.; Nunny, R. S.; Rolfe, M. S. THE FIELD ASSESSMENT OF EFFECTS OF DUMPING WASTES AT SEA: 2. METHODS. Fish. Res. Tech. Rep. Minist. Agric. Fish. Food (Lowestoft) No. 47. 24p. 1978. SFA 24(2)
[M.G. Norton: Minist. Agric. Fish. Food, Fish. Lab., Burnham-on-Crouch, England]

79-001430 Gallaway, P. J. SEASONAL ABUNDANCE AND DISTRIBUTION OF MARINE FISHES AT A HOT-WATER DISCHARGE IN GALVESTON BAY, TEXAS. Ph.D. dissertation, Tex. A&M Univ. 112p. 1978. From Diss. Abstr. Int. B Sci. Eng. 39(7):3127. Jan. 1979. SFA 24(2)

79-001431 Gammon, J. R. THE FISH COMMUNITY AS AN INDICATOR OF WATER QUALITY. Proc. Indiana Acad. Sci. 87: 172. 1977. Abstract only. SFA 24(2)
[Dep. Zool., DePauw Univ., Greencastle, IN 46135]

79-001432 Gruber, D.; Cairns, J., Jr.; Dickson, K. L.; Hendricks, A. C.; Cavell, M. A.; Landers, J. D., Jr.; Miller, W. R. III; Showalter, W. J., Jr. THE CONSTRUCTION, DEVELOPMENT, AND OPERATION OF A FISH BIOLOGICAL MONITORING SYSTEM. U. S. Army Contractor Rep. ARCSL-CR-78040. viii + 79p. Aug. 1978. SFA 24(2)
[Cent. Environ. Stud., VPI&SU, Blacksburg, VA 24061]

79-001433 Hughes, B. D. THE INFLUENCE OF FACTORS OTHER THAN POLLUTION ON THE VALUE OF SHANNON'S DIVERSITY INDEX FOR BENTHIC MACRO-INVERTEBRATES IN STREAMS. Water Res. 12 (5): 359-364. 1978. SFA 24(2)
[Thames Water Authority, 2nd floor, Reading Bridge House, Reading, Berkshire, England]

79-001434 Kaiser, K. L. E.; Valdmanis, I. ORGANOCHLORINE CONTAMINANTS IN A SEA LAMPREY (/PETROMYZON MARINUS/) FROM LAKE ONTARIO. J. Great Lakes Res. 4 (2): 234-236. 1978. SFA 24(2)
[Natl. Water Res. Inst., Can. Cent. Inland Waters, P.O. Box 5050, Burlington, ON L7R 4A6, Canada] A sea lamprey (/Petromyzon marinus/) specimen from Hamilton Beach, Lake Ontario, was analyzed for organochlorine pesticide and PCB residues. Contrary to the expectations, the residue levels observed were similar to those found in salmonid species. The concentrations of PCBs, DDT and metabolites, and mirex all exceeded the existing guidelines and proposed water quality objectives. Other organochlorine residues are below such limits, where existing. It is recommended to investigate organochlorine residues in sea lamprey from the Great Lakes in more detail.

79-001435 Koidsumi, K. [POLLUTION OF INLAND WATER WITH SPECIAL REFERENCE TO THE POLLUTION DUE TO EFFLUENTS FROM ELECTRO-PLATING.] In S. Motoda, ed. Propagation of Marine Resources of the Pacific Ocean. First Japan-USSR Joint Symp. Aquacult. Pac. Ocean: 1-4 Dec. 1972, Tokyo and Shimizu, Japan. p. 93-102. Sept. 1973. In Japanese with English summ. SFA 24(2)
[Shinshu Univ., Ueda, Japan]

79-001436 Larrick, S. R.; Dickson, K. L.; Cherry, D. S.; Cairns, J., Jr. DETERMINING FISH AVOIDANCE OF POLLUTED WATER. Hydrobiologia 61 (3): 257-265. 24 Nov. 1978. SFA 24(2)
[Biol. Dep., VPI&SU, Blacksburg, VA 24061] A critical evaluation is given of material and methods to be used for the study of behavioral repsonses of fish towards polluted water. Experiments with fathead minnows in a steep gradient of hypochlorite are described and discussed. Methods leading towards standarization of fish avoidance reactions are advocated.

79-001437 Margraf, F. J. THE ABUNDANCE AND DISTRIBUTION OF FISHES IN THE COOLING-WATER CANAL SYSTEM OF AN ELECTRIC GENERATING STATION, WITH EMPHASIS ON THE EFFECT OF COOLING TOWERS. Ph.D. dissertation, Tex. A&M Univ. 117p. 1978. From Diss. Abstr. Int. B Sci. Eng. 39(7): 3129. Jan. 1979. SFA 24(2)

79-001438 Mason, W. T., Jr. , (ed.) METHODS FOR THE ASSESSMENT AND PREDICTION OF MINERAL MINING IMPACTS ON AQUATIC COMMUNITIES: A REVIEW AND ANALYSIS. U.S. Fish Wildl. Serv. FWS/OBS-78/30. 157p. Apr. 1978. SFA 24(2)
[U.S. FWS, Harpers Ferry, WV 25425]

79-001439 Miller, W. R. III; Cairns, J., Jr.; Gruber, D.; Hendricks, A. C. THE USE OF RECENT CONCEPT IN BIOLOGICAL MONITORING TO STUDY THE VENTILATORY RATE CHANGES IN BLUEGILL SUNFISH (/LEPOMIS MACROCHIRUS/) FOLLOWING EXPOSURE TO CHLORINE. Am. Zool. 18 (3): 632. 1978. Abstract only. SFA 24(2)
[Cent. Environ. Stud., VPI&SU, Blacksburg, VA]

79-001440 Ogata, M.; Miyake, Y. DISAPPEARANCE OF AROMATIC HYDROCARBONS AND ORGANIC SULFUR COMPOUNDS FROM FISH FLESH REARED IN CRUDE OIL SUSPENSION. Water Res. 12 (12): 1041-1044. 1978. SFA 24(2)
[Dep. Publ. Health, Okayama Univ. Med. Sch., 2-5-1 Shikata-Cho, Okayama City, Okayama, Japan] Eels (/Anguilla japonica/ Temminck and Schlegel) were reared in sea water containing a crude oil suspension (50 ppm for 10 days for aromatic hydrocarbons, 2500 ppm for 3 days for organic sulfur compounds), then transferred to clean sea water. The disappearance of aromatic hydrocarbons and organic sulfur compounds from eel flesh was examined. Concentration ratio (concentration of eel flesh/concentration of water) of benzene, toluene, m- or p-xylene and o-xylene on 10 days is 3.5, 13.2, 23.6 and 21.4 respectively. Benzene, toluene, m- or p-xylene and o-xylene, disappeared after the transfer to clean sea water, and half life period is 0.5, 1.4, 2.6 and 2.0 days respectively in first phase which lasted 0-5 days. Organic sulfur compounds in eel flesh decreased as the time spent in clean sea water increased, but were still present after 30 days. The results suggest that aromatic hydrocarbons and organic sulfur compounds could serve as markers of oil pollution in fish.

79-001441 Oglesby, G. B.; Noell, W. C.; Delo, H. O.; Dyer, W. A.; England, R. H.; Fatora, J. P.; Grizzle, J. M.; Deutsch, S. J. TOXIC SUBSTANCES IN DISCHARGES OF HYPOLIMNETIC WATERS FROM A SEASONALLY STRATIFIED IMPOUNDMENT. Environ. Conserv. 5 (4): 287-293. 1978. SFA 24(2)
[P.O. Box 14493, Savannah, GA 31406]

79-001442 Satsmatadjis, J.; Gabrielides, G. P. CHLORINATED HYDROCARBONS IN STRIPPED MULLET (/MULLUS BARBATUS/) OF SARONIKOS BAY. Thalassographica 1 (2): 151-154. July 1977. In English with Greek summ. SFA 24(2)
[Inst. Oceanogr. Fish. Res., Aghios Kosmas, Hellinikon, Athens, Greece]

79-001443 Sivalingam, P. M.; Thavaraj, S. EFFICIENCY OF CANAL BIODEGRADATION OF PALM OIL SLUDGE AND ITS POLLUTION EFFECTS. Bull. Jpn. Soc. Sci. Fish. 44 (11): 1229-1237. Nov. 1978. SFA 24(2)
[Sch. Biol. Sci., Univ. Sains Malaysia, Minden, Pulau Pinang, Malaysia]

79-001444 Stout, V. F.; Beezhold, F. L. ANALYSIS OF CHLORINATED HYDROCARBON POLLUTANTS: A SIMPLIFIED EXTRACTION AND CLEANUP PROCEDURE FOR FISHERY PRODUCTS. NOAA Fish. Bull. 76 (4): 880-886. 1979. SFA 24(2)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

79-001445 Suns, K.; Rees, G. A. ORGANOCHLORINE CONTAMINANT RESIDUES IN YOUNG-OF-THE-YEAR SPOTTAIL SHINERS FROM LAKES ONTARIO, ERIE, AND ST. CLAIR. J. Great Lakes Res. 4 (2): 230-233. 1978. SFA 24(2)
[Ontario Minist. Environ., Box 213, Rexdale, ON M9W 5L1, Canada]
The spottail shiner (/Notropis hudsonius/) was found to be a useful biological integrator of organochlorine contaminants in near-shore habitats. During the fall of 1975 spottail shiners were collected from nine sampling sites on Lakes Ontario, Erie and St. Clair. The restricted home range of the young-of-the-year spottail and its relatively short exposure to contaminants facilitated localized residue level assesment and reflected on recent contaminant loadings. Contaminant types and residue levels in fish generally reflected the regional land-practices. All samples analyzed contained PCB and DDT residues, while some also contained heptachlor epoxide, dieldrin, endrin and chlordane. Mean PCB concentrations for the young-of-the-year spottails ranged from 59 ng/g - 844 ng/g wet weight, while total DDT residues ranged from 32 ng/g - 244 ng/g. The mean PCB residue concentrations in seven of the nine fish collections tested exceeded the 100 ng/g body burden level recommended for protection of wildlife by the I.J.C.

79-001446 Uda, M. COMPLEXITY OF RECENT MARINE POLLUTION IN JAPANESE WATERS. In S. Motoda, ed. Propagation of Marine Resources of the Pacific Ocean. First Japan-USSR Joint Symp. Aquacult. Pac. Ocean: 1-4 Dec. 1972, Tokyo and Shimizu, Japan. p. 103-111. Sept. 1973. SFA 24(2)
[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Japan]

79-001447 Walton, D. G.; Penrose, W. R.; Green, J. M. THE PETROLEUM-INDUCIBLE MIXED-FUNCTION OXIDASE OF CUNNER (/TAUTOGOLABRUS ADSPERSUS/ WALBAUM 1792): SOME CHARACTERISTICS RELEVANT TO HYDROCARBON MONITORING. J. Fish. Res. Board Can. 35 (12): 1547-1552. Dec. 1978. In English with French summ. SFA 24(2)
[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

FISH KILLS

79-001448 Milstein, C. B.; Garlo, E. V.; Jahn, A. E. A MAJOR KILL OF MARINE ORGANISMS IN THE MIDDLE ATLANTIC BIGHT DURING SUMMER 1976. Ichthyol. Assoc. Inc. Bull. No. 16. v + 56p. May 1977. SFA 24(2)
[Ichthyol. Assoc., Inc., Box 70-D, R.D. 2, West Brook Lane, Absecon, NJ 08201]

TOXICOLOGY; BIOASSAYS

79-001449 Abel, P. D. MORTALITY PATTERNS IN TROUT (/SALMO TRUTTA/ AND /S. GAIRDNERI/) EXPOSED TO AN ANIONIC DETERGENT IN RELATION TO CONCENTRATION AND MECHANISMS OF TOXIC ACTION. Freshwater biol. 8 (5): 497-503. Oct. 1978. SFA 24(2)
[Dep. Biol., Sunderland Polytech., Chester Rd., Sunderland SR 3SD, England] Histological and electron microscopical study of the gills of fish poisoned by the anionic detergent sodium lauryl sulphate indicates that the nature of the toxic action changes at a concentration of about 120 mg l^{-1}. Toxicity tests were conducted to determine whether this change could be detected in the test data, using brown trout (/Salmo trutta/) and rainbow trout (/S. gairdneri/). Toxicity curves showed no indication of the change in toxic action, but at concentrations of 120 and 130 mg l^{-1} of sodium lauryl sulphate 'split' probit lines occurred, and the lines for 150 mg l^{-1} consistently differed in slope from other lines.

79-001450 Alexander, D. G.; Clarke, R. Mc.V. THE SELECTION AND LIMITATIONS OF PHENOL AS A REFERENCE TOXICANT TO DETECT DIFFERENCES IN SENSITIVITY AMONG GROUPS OF RAINBOW TROUT (/SALMO GAIRDNERI/). Water Res. 12 (12): 1085-1090. 1978. SFA 24(2)
[Canada-British Columbia Okanagan Basin Implementation Agreement, 264 Westminster Ave., Box 458, Penticton, BC V2A 6K6, Canada] Phenol was better than sodium azide, sodium pentachlorophenate, copper sulphate and dodecylsodium sulphate in detecting differences in sensitivity among groups of rainbow trout (/Salmo gairdneri/). Phenol detected differences in sensitivity among strains of trout and could discern the effects of starvation, temperature stress and pre-exposure to 0.04 mg l^{-1} chlorine on the sensitivity of trout to phenol, but not the effects of three brands of food and high mortality during holding. The sensitivity of rainbow trout to phenol was independent of weight and loading density in the bioassays. The use of phenol as a reference toxicant for the rapid detection of differences in sensitivity among groups of fish is limited because differences can only be detected by comparing the sensitivity of an unknown group of fish to that of a known, unstressed group of fish in the same bioassay. The concept of a single reference toxicant appropriate for bioassays with a variety of chemicals is questionable because differences among groups of fish, which are detectable by a reference toxicant, may not affect the results of bioassays with other chemicals. A series of physiological

79-001450 CONTINUED
and behavioural screening tests and diagnostic health checks may be more useful than reference toxicants to identify groups of fish which should not be used in bioassays.

79-001451 Baird, R.; Bottomley, J.; Taitz, H. AMMONIA TOXICITY AND PH CONTROL IN FISH TOXICITY BIOASSAYS OF TREATED WASTEWATERS. Water Res. 13 (2): 181-184. 1979. SFA 24(2)
[Cty. Sanitation Dist. Los Angeles Cty., 1965 S. Workman Mill Rd., Whittier, CA 90601] A means of preventing anomalous fish kills in static bioassay testing of ammonia-containing treated wastewaters is described. Low flow O(2) is used instead of air in order to prevent CO(2) stripping, subsequent pH rise and increases in the NH(3) levels during the course of the test.

79-001452 Beattie, J. H.; Pascoe, D. CADMIUM UPTAKE BY RAINBOW TROUT, /SALMO GAIRDNERI/ EGGS AND ALEVINS. J. Fish Biol. 13 (5): 631-637. Nov. 1978. SFA 24(2)
[Dep. Appl. Biol., Univ. Wales Inst. Sci. Technol., Cathays Park, Cardiff, Wales] The uptake of cadmium by eggs and alevins of rainbow trout from water concentrations of between 0.01 and 50.0 mg Cd 1^{-1} was investigated. The cadmium content of eggs and alevins increased with time and with exposure concentration. Lower cadmium levels were detected in alevins than in eggs. Most of the cadmium (98 percent) in the eggs was found to be associated with the egg membrane or chorion. This explains the considerable reduction in cadmium concentration observed in alevins after hatching. Alevins hatching from eggs which had been exposed to cadmium survived longer in cadmium than alevins not exposed as eggs. This suggests that the pretreatment of eggs with cadmium serves some protective function. Behavioural and pathological signs of cadmium poisoning such as erratic swimming and blood clotting in alevins were observed.

79-001453 Benoit, D. A.; Holcombe, G. W. TOXIC EFFECTS OF ZINC ON FATHEAD MINNOWS /PIMEPHALES PROMELAS/ IN SOFT WATER. J. Fish Biol. 13 (6): 701-708. Dec. 1978. SFA 24(2)
[U.S. EPA, 6201 Congdon Blvd., Duluth, MN 55804] A fathead minnow life-cycle exposure to various zinc concentrations demonstrated that the most sensitive indicators of zinc toxicity were egg adhesiveness and fragility, which were significantly affected at 145 ug Zn 1^{-1} and above, but were not affected at 78 ug Zn 1^{-1} and below. These effects occurred shortly after the eggs were spawned (during water hardening) and therefore were not related to effects on the parental fish. Hatchability and survival of larvae were significantly reduced, and deformities at hatching were significantly increased at 295 ug Zn 1^{-1} and above. Acclimated and unacclimated groups of larvae exposed to identical zinc concentrations for 8 weeks after hatch showed only slight differences in sensitivity.

79-001454 Biro, P. ACUTE EFFECTS OF THE SODIUM SALT OF 2,4-D ON THE EARLY DEVELOPMENTAL STAGES OF BLEAK, /ALBURNUS ALBURNUS/. J. Fish Biol. 14 (1): 101-109. Jan. 1979. SFA 24(2)
[Hungarian Acad. Sci., Biol. Res. Inst., 8237 Tihany, Hungary] The acute effects of a herbicide based on 2,4-D on embryos and larvae of bleak, /Alburnus alburnus/ L. Exposed to concentrations of 25-3200 mg 1^{-1} for 12-48 hours were investigated. The 2,4-D delayed or stopped the development of embryos in their early stages, caused behavioural changes and morphological alterations. The L.C.(50) values for embryos varied between 12.9 and 159.4 mg 1^{-1} and for larvae from 51.6 to 111.2 mg 1^{-1} according to the time of exposure. The level of 2,4-D in Lake

79-001454 CONTINUED
Balaton, or similar shallow lakes, without substantial injury of the littoral fish fauna should not surpass 0.5-1.0 mg l^{-1}.

79-001455 Bolis, L.; Rankin, J. C. VASCULAR EFFECT OF ACETYLCHOLINE, CATECHOLAMINES AND DETERGENTS ON ISOLATED PERFUSED GILLS OF PINK SALMON, /ONCORHYNCHUS GORBUSCHA/ COHO SALMON, /O. KISUTCH/ AND CHUM SALMON, /O. KETA/. J. Fish Biol. 13 (5): 543-547. Nov. 1978. SFA 24(2)
[Inst. Gen. Physiol., Univ. Messina, 5 Via del Vespro, Messina, Italy] Acetylcholine caused vasoconstriction whilst adrenaline and isoprenaline caused vasodilation in isolated perfused Pacific salmon gills. The detergent LAS produced concentration dependent vasodilation when present in the perfusate in concentrations of 0.6 to 3 mg l^{-1}. The effect of LAS was partly blocked by propranalol suggesting the involvement of Beta-adrenergic receptors. The maximum responses obtained with acetylcholine, adrenaline or LAS were all much greater in sea water or pre-spawning freshwater fish than in spawning fish.

79-001456 Chapman, G. A.; Stevers, D. G. ACUTELY LETHAL IEVELS OF CADMIUM, COPPER, AND ZINC TO ADULT MALE COHO SALMON AND STEELHEAD. Trans. Am. Fish. Soc. 107 (6): 837-840. Nov. 1978. SFA 24(2)
[U.S.EPA, West. Fish Toxicol. Stn., Corvallis, OR 97330]

79-001457 Chapman, G. A. EFFECTS OF CONTINUOUS ZINC EXPOSURE ON SOCKEYE SALMON DURING ADULT-TO-SMOLT FRESHWATER RESIDENCY. Trans. Am. Fish. Soc. 107 (6): 828-836. Nov. 1978. SFA 24(2)
[U.S. EPA, West. Fish Toxicol. Stn., Corvallis, OR 97330]

79-001458 Chapman, G. A. TOXICITIES OF CADMIUM, COPPER, AND ZINC TO FOUR JUVENILE STAGES OF CHINOOK SALMON AND STEELHEAD. Trans. Am. Fish. Soc. 107 (6): 841-847. Nov. 1978. SFA 24(2)
[U.S. EPA, West. Fish Toxicol. Stn., Corvallis, OR 97330]

79-001459 Colt, J.; Tchobanoglous, G. CHRONIC EXPOSURE OF CHANNEL CATFISH, /ICTALURUS PUNCTATUS/, TO AMMONIA: EFFECTS ON GROWTH AND SURVIVAL. Aquaculture 15 (4): 353-372. Dec. 1978. SFA 24(2)
[Dep. Civ. Eng., Univ. Calif., Davis 95616] The growth of juvenile channel catfish (/Ictalurus punctatus/) was reduced in a linear manner during a 31 day growth trial when exposed to concentrations of ammonia ranging from 48 to 989 ug/l NH(3)-N (0.31 to 5.71 mg/l $NH^+(4)$-N) On a wet weight basis, growth was reduced by 50 percent at 517 ug/l NH(3)-N and the no growth occured at 967 ug/l. The no growth level was 60 percent of 96-h LC50 value. Mortality was increased significantly at 989 ug/l NH(3)-N and above. The sublethal effects of ammonia may depend, in part, on the concentrations of $NH^+(4)$ and Na^+ in solution.

79-001460 Diwan, A. D.; Hingorani, H. G.; Naidu, N. C. IEVELS OF BLOOD GLUCOSE AND TISSUE GLYCOGEN IN TWO LIVE FISH EXPOSED TO INDUSTRIAL EFFLUENT. Bull. Environ. Contam. Toxicol. 21 (1/2): 269-272. Jan. 1979. SFA 24(2)
[Cent. Fish. Ext. Training Cent., Saidabad Colony, Hyderabad-500 659, India]

79-001461 FAO of the UN REPORT OF THE ACMRR/IABO WORKING PARTY ON BIOLOGICAL EFFECTS OF POLLUTANTS AND REPORT OF THE ACMRR/IABO EXPERT CONSULTATION ON BIOASSAYS WITH AQUATIC ORGANISMS IN RELATION TO POLLUTION PROBLEMS. FAO Fish Rep. No. 187. v + 28p. 1977. SFA 24(2)
[Rome, Italy]

79-001462 Gardner, G. R. A REVIEW OF HISTOPATHOLOGICAL EFFECTS OF SELECTED CONTAMINANTS ON SOME MARINE ORGANISMS. Mar. Fish. Rev. 40 (10): 51-52. Oct. 1978. SFA 24(2)
[U.S. EPA, Narragansett, RI 02882]

79-001463 Griffith, R. W.; Pang, P. K. T.; Benedetto, L. A. UREA TOLERANCE IN THE KILLIFISH, /FUNDULUS HETEROCLITUS/. Comp. Biochem. Physiol. A Comp. Physiol. 62 (2): 327-330. 1979. SFA 24(2)
[Dep. Biol., Southeast. Mass. Univ., North Dartmouth 02747]
Killifish, /Fundulus heteroclitus/, were exposed to high urea concentrations at different salinities. Mortality, plasma urea and plasma sodium were determined. Following a step-wise increase in environmental urea, seawater (SW) fish die at concentrations from 0.6 to 1.0 M. At a constant 0.4 M urea concentration, higher mortality is found in fresh water (FW) than in SW or 1/3 SW. Plasma urea of fish in 0.4 M urea is less than that of the environment and ranged from 197 mM in SW to 260 mM in 1/3 SW ater 3 days and 370 mM in SW fish after 9 days. High urea elicited changes in plasma sodium that followed the environmental gradient. Evolutionary implications of the moderately low toxicity of urea to the teleost fishes are discussed.

79-001464 Guthrie, R. K.; Cherry, D. S. TROPHIC LEVEL ACCUMULATION OF HEAVY METALS IN A COAL ASH BASIN DRAINAGE SYSTEM. Water Resour. Bull. 15 (1): 244-248. Feb. 1979. SFA 24(2)
[Univ. Tex. Health Sci. Cent., Sch. Publ. Health, Houston 77025]

79-001465 Hallas, T. E. ON THE ACCUMULATION AND METABOLIZATION OF PENTACHLOROPHENOL IN FISH. Medd. Dan. Fisk.- Havunders. 7: 75-84. 1973. SFA 24(2)
[Danish Inst. Fish. Mar. Res., Cahrlottenlund Castle, DK-2920 Charlottenlund, Denmark] Three different techniques confirm that the fish /Lebistes reticulatus/ accumulates the herbicide pentachlorophenol. Treating the fish for one hour or less in a PCP test solution they accumulate up to 1°/oo of their own weight before they are killed by the poison. Only one percent of this is recovered in the killed fish--because in the same period they metabolize until 99 percent of the accumulated dose. This is conflicting with the published data so far, but in fact it can be shown that the discrepency is due to unbalanced experimental conditions. It is demonstrated that the acute toxicity does not depend on the amount of PCP accumulated from the test solution or the amount of PCP found in the fish, but rather on the difference between them. PCP /per se/ is untoxic to fish. Instead the toxicity refers to the presence of (still unidentified) metabolites of the /in vivo/ metabolization of PCP or chemical changes which are coupled with the PCP metabolization in the fish. The common predioxins and dioxins, contaminants in technical PCP, could be excluded when looking for toxic metabolites, as they are untoxic to fish.

79-001466 Hendricks, J. D.; Putnam, T. P.; Sinnhuber, R. O. EFFECT OF DIETARY DIELDRIN ON AFLATOXIN B(1) CARCINOGENESIS IN RAINBOW TROUT (/SALMO GAIRDNERI/). J. Environ. Pathol. Toxicol. 2 (3): 719-728. Jan.-Feb. 1979. SFA 24(2)
[Dep. Food. Sci. Technol., Oreg. State Univ., Corvallis 97331]

79-001467 Huckabee, J. W.; Janzen, S. A.; Blaylock, B. G.; Talmi, Y; Beauchamp, J. J. METHYLATED MERCURY IN BROOK TROUT (/SALVELINUS FONTINALIS/): ABSENCE OF AN IN VIVO METHYLATING PROCESS. Trans. Am. Fish. Soc. 107 (6): 848-852. Nov. 1978. SFA 24(2)
[Environ. Sci. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830]

79-001468 Hughes, G. M.; Flos, R. ZINC CONTENT OF THE GILLS OF RAINBOW TROUT (/S. GAIRDNERI/) AFTER TREATMENT WITH ZINC SOLUTIONS UNDER NORMOXIC AND HYPOXIC CONDITIONS. J. Fish Biol. 13 (6): 717-728. Dec. 1978. SFA 24(2)
[Res. Unit Comp. Anim. Respir., Bristol Univ., Bristol, England] Forty specimens of rainbow trout (54-127g) were divided into 4 groups which were treated as follows: (a) normoxic clean water; (b) hypoxic clean water; (c) normoxic water with 10 ppm zinc for 10h; (d) hypoxic water with 10 ppm zinc for 10 h. The zinc content was determined separately for each of the 4 gill arches on each side of the fish. Values for the zinc concentration were greater following the zinc treatments, but no significant difference between hypoxia and normoxia was observed. Differences in concentrations of zinc were found in different arches whether expressed per gram dry weight or per unit surface area of the secondary lamellae.

79-001469 Johansson, N.; Runn, P.; Milbrink, G. EARLY DEVELOPMENT OF THREE SALMONID SPECIES IN ACIDIFIED WATER. Zoon 5 (2): 127-132. 1977. SFA 24(2)
[Inst. Zoophysiol., Uppsala Univ., Sweden] Eggs of sea-run brown trout (two strains), salmon and brook trout were reared under laboratory conditions at different pH-levels. The experiments were terminated just prior to the full resorption of the yolk of the fry. Salmon was found to be the most pH-sensitive species. An increase in mortality could be discerned at pH 5.0. Brown trout and brook trout were apparently less pH-sensitive. Both species showed a lower limit of tolerance of slightly below pH 5. Brook trout gave few signs of being affected until about pH 4.5. With due reservation for interacting factors, such as the composition of the water, the results are well in accordance with experience gained in the field here and elsewhere in the northern hemisphere. Because of its stationary habits brook trout could be a game-fish to recommend for introduction in moderately acid river courses when the original fish fauna has been wiped out.

79-001470 Johansson-Sjobeck, M.-L.; Larsson, A. THE EFFECT OF CADMIUM ON THE HEMATOLOGY AND ON THE ACTIVITY OF DELTA-AMINOLEVULINIC ACID DEHYDRATASE (ALA-D) IN BLOOD AND HEMATOPOIETIC TISSUES OF THE FLOUNDER, /PLEURONECTES FLESUS/ L. Environ. Res. 17 (2): 191-204, Oct. 1978. SFA 24(2)
[A. Larsson: Natl. Environ. Prot. Board, Brackish Water Toxicol. Lab., Studsvik, Pack, S-611 01 Nykoping, Sweden]

79-001471 Johnson, C. R. THE EFFECTS OF SUBLETHAL CONCENTRATIONS OF FIVE ORGANOPHOSPHORUS INSECTICIDES ON TEMPERATURE TOLERANCE, REFLEXES, AND ORIENTATION IN /GAMBUSIA AFFINIS AFFINIS/ (PISCES: POECILIIDAE). Zool. J. Linn. Soc. 64 (1): 63-70. Sept. 1978. SFA 24(2)
[Div. Biol. Control, Univ. Calif., 1050 San Pablo Ave., Berkeley 94706] /Gambusia affinis/ were exposed to the insecticides ABATE, fenthion, chlorpyrifos, methyl parathion, and malathion for 24 h at concentrations of 1, 5, and 10 ppb and for 48 h at 5 ppb. The thermal tolerance was lowered significantly for male and female /G. affinis/ by the toxicants methyl parathion and chlorpyrifos at 5 and 10 ppb with 24 h exposure. Activity was restricted with fish exposed to methyl parathion and chlorpyrifos at concentrations of 10 ppb for 24 h and at 5 ppb for 48 h.

79-001472 Jolly, A. L., Jr.; Avauld, J. W., Jr.; Koonce, K. L.; Graves, J. B. ACUTE TOXICITY OF PERMETHRIN TO SEVERAL AQUATIC ANIMALS. Trans. Am. Fish. Soc. 107 (6): 825-827. Nov. 1978. SFA 24(2)
[Sch. For. Wildl. Manage., La. State Univ., Baton Rouge 70803]

79-001473 Jonsson, A.-C.; Nilsson, S. EFFECTS OF PH, TEMPERATURE AND Cu^2 ON THE ACTIVITY OF DOPAMINE-BETA-HYDROXYLASE FROM THE CHROMAFFIN TISSUE OF THE COD, /GADUS MORHUA/. Comp. Biochem. Physiol. C Comp. Pharmacol. 62 (1): 5-8. 1979. SFA 24(2)
[Dep. Zoophysiol., Univ. Goteborg, Sweden] The activity of dopamine-beta-hydroxylase (DBH; E.C. 1.14.17.1) from the chromaffin tissue in the posterior cardinal veins of the Atlantic cod, /Gadus morhua/, was estimated using tyramine as substrate. The activity of DBH in the tissue homogenates used in the present study is 7.3 ± 0.7 umol octopamine formed per gram tissue per hour. The activity of DBH was increased by addition of Cu^{2+} with an optimum at a Cu^{2+}-ion concentration of 10 uM. The enzymatic activity shows an optimum at pH = 5.4, and of the temperature tested (10°, 19°, 22°, 27°, and 37°), 27°C gave the highest DBH-activity.

79-001474 Kariya, T.; Haga, H.; Haga, Y.; Kawasaki, Y. [STUDIES ON THE POST-MORTEM IDENTIFICATION OF THE POLLUTANT IN FISH KILLED BY WATER POLLUTION.--XIII. CADMIUM.] Bull. Jpn. Soc. Sci. Fish. 44 (10): 1065-1072. Oct. 1978. In Japanese with English summ. SFA 24(2)
[Dep. Fish. Fac. Agric., Tohoku Univ., Tsutsumidori, Sendai-shi, Miyagi, 980, Japan]

79-001475 Lewis, M. ACUTE TOXICITY OF COPPER, ZINC AND MANGANESE IN SINGLE AND MIXED SALT SOLUTIONS TO JUVENILE LONGFIN DACE, /AGOSIA CHRYSOGASTER/. J. Fish Biol. 13 (6): 695-700. Dec. 1978. SFA 24(2)
[Environ. Safety Dep., Proctor & Gamble Co., Cincinnati, OH 45217] The acute toxicity of copper, zinc and manganese and copper-zinc and copper-manganese mixtures were determined for juvenile longfin dace, /Agosia chrysogaster/ in hard water bioassays (mean=218 mg l^{-1} CaCO(3)).
Copper-zinc was the most lethal toxicant (96-h L.C.(50)=0.21 mg l^{-1} copper and 0.28 mg l^{-1} zinc) and exhibited a more than additive toxicity which was in contrast to the additive toxicity of copper-manganese mixtures (96-h L.C.(50)=0.45 mg l^{-1} copper and 64.0 mg l^{-1} manganese). The toxicity of copper (96-h L.C.(50)=0.86 mg l^{-1}) and zinc (96-h L.C.(50)=0.79 mg l^{-1}) to the fish was similar but both were considerably more lethal than manganese (96-h L.C.(50)=130 mg l^{-1}).

79-001476 Loveland, P. M.; Nixon, J. E.; Pawlowski, N. E.; Eisele, T. A.; Libbey, L. M.; Sinnhuber, R. O. AFLATOXIN B(1) AND AFLATOXICOL METABOLISM IN RAINBOW TROUT (/SALMO GAIRDNERI/) AND THE EFFECTS OF DIETARY CYCLOPROPENE. J. Environ. Pathol. Toxicol. 2 (3): 707-718. Jan.-Feb. 1979. SFA 24(2)
[Dep. Food Sci. Technol., Oreg. State Univ., Corvallis 97331]

79-001477 Matthiessen, P.; Johnson, J. S. ACCUMULATION OF THE ORGANOPHOSPHATE BLACKFLY LARVICIDE ABATE (TEMEPHOS) IN /SAROTHERODON MOSSAMBICUS/, WITH REFERENCE TO THE LARVICIDAL CONTROL OF /SIMULIUM DAMNOSUM/. J. Fish Biol. 13 (5): 575-586. Nov. 1978. SFA 24(2)
[Cent. Overseas Pest Res., Molluscicide Group, 56 Gray's Inn Rd., London WC1X 8LU, England] This paper describes the uptake and fate of the organophosphate larvicide Abate (temephos) in the tropical food fish, /Sarotherodon mossambicus/ (Peters), during exposure to concentrations (nominally 0.001-0.1 mg dm^{-3}) similar to those being produced in West African rivers by the WHO Onchocerciasis Control programme. /S. mossambicus/ was able to absorb Abate both directly from the surrounding water, and by contaminated food. Maximum residue concentrations were proportional to dosage and were elevated in starving fish. Internal distribution depended on tissue fat content. Some fish produced the sulphoxide metabolite, and total residues diminished slowly during recovery.

79-001478 Moss, J. L. TOXICITY OF SELECTED CHEMICALS TO THE FAIRY SHRIMP, /STREPTOCEPHALUS SEALI/, UNDER LABORATORY AND FIELD CONDITIONS. Prog. Fish-Cult. 40 (4): 158-160. Oct. 1978. SFA 24(2)
[Ala. Dep. Conserv. Nat. Resour., Game Fish Div., 64 N. Union St., Montgomery 36130]

79-001479 Murai, T.; Andrews, J. W.; Muller, J. W. FINGERLING AMERICAN SHAD: EFFECT OF VALIUM, MS-222, AND SODIUM CHLORIDE ON HANDLING MORTALITY. Prog. Fish-Cult. 41 (1): 27-33. Jan. 1979. SFA 24(2)
[Tunison Lab. Fish Nutr., Hagerman Field Stn., Hagerman, ID 83332]

79-001480 Neville, C. M. SUBLETHAL EFFECTS OF ENVIRONMENTAL ACIDIFICATION ON RAINBOW TROUT (/SALMO GAIRDNERI/). J. Fish. Res. Board Can. 36 (1): 84-87. Jan. 1979. In English with French summ. SFA 24(2)
[Dep. Zool., Univ. Toronto, Toronto, ON M5S 1A1, Canada]

79-001481 Passino, D. R. M.; Cotant, C. A. ALLANTOINASE IN LAKE TROUT (/SALVELINUS NAMAYCUSH/): /IN VITRO/ EFFECTS OF PCBS, DDT AND METALS. Comp. Biochem. Physiol. C Comp. Pharmacol. 62 (1): 71-75. 1979. SFA 24(2)
[U.S. FWS, 1451 Green Rd., Ann Arbor, MI 48105] Allantoinase, an enzyme in the purine-urea cycle, was found in livers of /Salvelinus namaycush/ (Osteichthyes: Salmoniformes). The enzyme was active from pH 6.6 to 8.2 at 37°C and from pH 7.4 to 9.0 at 10°C and had an Arrhenius energy of activation of 11.0 kcal/mol and a temperature quotient of 2.0. The K(m) of the enzyme homogenate was 8.4mM allantoin. The concentrations of inorganic metals at which 50 percent inhibition occurred during /in vitro/ exposure were 6.0 mg/l Cu^{2+}, 6.7 mg/l Cd^{2+}, 34 mg/l Hg^{2+} and 52 mg/l Pb^{2+}. The /in vitro/ sensitivity of PCBs, DDT and DDE and kinetics in the presence of metals were determined. Allantoinase activity was negatively correlated with body length for fish from Lake Michigan but not from Lake Superior or the

79-001481 CONTINUED
laboratory.

79-001482 Phillips, G. R.; Buhler, D. R. INFLUENCES OF DIELDRIN ON THE GROWTH AND BODY COMPOSITION OF FINGERLING RAINBOW TROUT (/SALMO GAIRDNERI/) FED OREGON MOIST PELLETS OR TUBIFICID WORMS (/TUBIFEX/ SP.). J. Fish. Res. Board Can. 36 (1): 77-80. Jan. 1979. In English with French summ. SFA 24(2)
[Coop. Fish. Res. Unit, Mont. State Univ., Bozeman 59717]

79-001483 Phillips, G. R.; Buhler, D. THE RELATIVE CONTRIBUTIONS OF METHYLMERCURY FROM FOOD OR WATER TO RAINBOW TROUT (/SALMO GAIRDNERI/) IN A CONTROLLED LABORATORY ENVIRONMENT. Trans. Am. Fish. Soc. 107 (6): 853-861. Nov. 1978. SFA 24(2)
[Coop. Fish. Res. Unit, Mont. State Univ., Bozeman 59717]

79-001484 Black, P. A.; Skinner, E. R.; Rogie, A.; Mitchell, A. I. DISTRIBUTION OF DDT BETWEEN THE LIPOPROTEINS OF TROUT SERUM. Comp. Biochem. Physiol. C Comp. Pharmacol. 62 (1): 119-125. 1979. SFA 24(2)
[Nat. Environ. Res. Council Inst. Mar. Biochem., St. Pittick's Rd., Aberdeen AB1 3RA, Scotland]

79-001485 Reiff, B.; Lloyd, R.; How, M. J.; Brown, D.; Alabaster, J. S. THE ACUTE TOXICITY OF ELEVEN DETERGENTS TO FISH: RESULTS OF AN INTERLABORATORY EXERCISE. Water Res. 13 (2): 207-210. 1979. SFA 24(2)
[Shell Res. Ltd., Shell Toxicol. Lab., Sittingbourne Res. Cent., Sittingbourne, Kent ME9 8AG, England]

79-001486 Runn, P.; Johansson, N.; Milbrink, G. SOME EFFECTS OF LOW PH ON THE HATCHABILITY OF EGGS OF PERCH, /PERCA FLUVIATILIS/ L. Zoon 5
(2): 115-125. 1977. SFA 24(2)
[Inst. Zool., Uppsala Univ., Uppsala, Sweden] Eggs of perch, /Perca fluviatilis/ L., were reared at different pH levels under laboratory conditions and also in an acidified water system. At pH levels below 5.5 a reduction in hatchability was discerned and at pH 4.5 hatching was found only sporadically. In eggs reared at pH 5.0-4.5 the mortality up to the expected hatching date was low and 100 mortality was reached only after a prolonged non-hatched period 5-10 days later. The viability of the fry from the eggs reared at pH 5.0-4.5 was confirmed when eggs from this pH range were transferred to pH 7.3 at the normal hatching date and reached a hatching success close to that found for eggs reared at pH 7.3 throughout the period. After a prolonged non-hatched period the fry from eggs reared at and below pH 5.0 showed malformations. Histological studies indicate that the normal digeration of the choirion by choriolytic enzymes is disturbed at pH levels below 5.0.

79-001487 Sastry, K. V.; Sharma, S. K. /IN VIVO/ EFFECTS OF ENDRIN ON THREE PHOSPHATASES IN KIDNEY AND LIVER OF THE FISH /OPHIOCEPHALUS PUNCTATUS/. Bull. Environ. Contam. Toxicol. 21 (1/2): 185-189. Jan. 1979. SFA 24(2)
[Dep. Zool., D.A.V. (P.G.) Coll., Muzaffarnagar (U.P.), India] The Effect of endrin (0.030 ppm) on the acid phosphatase, alkaline phosphatase and glucose-6-phosphatase activities in the kidney and liver of a teleost fish, /Ophiocephalus (Channa) punctatus/ has been studied. The period of exposure was twenty days. An increase in the

79-001487 CONTINUED
acid phosphatase activity is noted in the two tissues examined here. There is no significant change in the activity of alkaline phosphatase in kidney while in liver the enzyme is inhibited. In the kidney glucose-6-phophatase showed a slight increase in activity but it is inhibited in liver.--summ.

79-001488 Sastry, K. V.; Gupta, P. K. ALTERATION IN THE ACTIVITIES OF THREE PEPTIDASES AND LIPASE IN THE DIGESTIVE SYSTEM OF THE FISH /CHANNA PUNCTATUS/ EXPOSED TO LEAD NITRATE. Bull. Environ. Contam. Toxicol. 21 (1/2): 190-195. Jan. 1979. SFA 24(2)
[Dep. Zool., D.A.V. (P.G.) Coll., Muzuffarnagar (U.P.), India] The effect of exposure of /Channa punctatus/ to LC(50) (6.8 mg/L) and sublethal concentration (2.8 mg/L) of lead nitrate on the activities of amino tripeptidase, glycylglycine, leucyl-l-glycine dipeptidases and lipase has been investigated. An inhibition in the activities of all the enzymes is noted after 96 hr, 15 and 30 days of treatment period. The inhibition in lipase activity is statistically insignificant in both the acute and chronic treatment cases. The experiments indicate that lead induced toxicity is more severe in chronic treatment as compared to acute treatment.--summ.

79-001489 Sastry, K. V.; Gupta, P. K. CHRONIC MERCURIC CHLORIDE INTOXICATION IN THE DIGESTIVE SYSTEM OF /CHANNA PUNCTATUS/. J. Environ. Pathol. Toxicol. 2 (2): 443-446. Nov.-Dec. 1978. SFA 24(2)
[Dep. Zool., D.A.V. (P.G.) Coll., Muzaffarnagar (U.P.), India] The effect of a sublethal concentration (0.30 mg/l) of mercuric chloride exposure on the activities of akaline phosphatase, acid phosphatase, amylase, trypsin, and pepsin has been examined at intervals of 7, 15, and 30 days in the digestive system of a teleost fish, /Channa punctatus/. An inhibition in the activity of all the above enzymes was noted after the first week of treatment. Treatment of the fishes for 15 days resulted in a marked increase in activity of all the enzymes. A slight fall in enzyme activity was recorded after 30 days, but the overall activity was higher than in control fishes.

79-001490 Sastry, K. V.; Gupta, P. K. CHRONIC MERCURIC CHLORIDE INTOXICATION IN DIGESTIVE SYSTEM OF /CHANNA PUNCTATUS/. J. Toxicol. Environ. Health 4 (5/6): 777-783. Sept.-Nov. 1978. SFA 24(2)
[Dep. Zool., D.A.V. (P.G.) Coll., Muzaffarnagar, India] The effect of exposure to a sublethal concentration (0.30 mg/l) of mercuric chloride on the activities of alkaline phosphatase, acid phosphatatse, amylase, trypsin, and pepsin has been examined at intervals of 7, 15, and 30 d in the digestive system of a teleost fish, /Channa punctatus/. Inhibition of the activities of all these enzymes was noted after the first week of treatment. Treatment of the fish for 15 d resulted in marked increases in the activities of all the enzymes. A slight fall in enzyme activity was recorded after 30 d, but the overall activity was higher than in control fish.

79-001491 Sastry, K. V.; Gupta, P. K. HISTOPATHOLOGICAL AND ENZYMOLOGICAL STUDIES ON THE EFFECTS OF CHRONIC LEAD NITRATE INTOXICATION IN THE DIGESTIVE SYSTEM OF A FRESHWATER TELEOST, /CHANNA PUNCTATUS/. Environ. Res. 17 (3): 472-479. Dec. 1978. SFA 24(2)
[606/1C Civil Lines South, Muzaffarnagar 251 001, India] The effect of lead nitrate on the digestive system of a teleost fish, /Channa punctatus/ has been studied after 125 days of exposure to a sublethal concentration (6.8 mg/liter). The results show that considerable degenerative changes are produced in the histological structure of liver, intestine, and pyloric caeca. In the liver, the damage is in

79-001491 CONTINUED
the form of liver cord disarray, necrosis, inflammation of portal areas, hardening of connective tissue, shrinkage of nuclei, and septa formation around blood vessels. No fatty infiltration or glycogen depletion has been observed. Lipofuscin granules accumulated in the cytoplasm of hepatocytes. In the intestine and pyloric caeca flattening of villi at a number of places, inflammation, and necrosis are the most conspicuous changes. The activities of alkaline phosphatase and aminotripeptidase are inhibited in the liver. In stomach, alkaline phosphatase is inhibited but an elevation in amylase activity was noted. Acid phosphatase showed an increase in the intestine and pyloric caeca while aminotripeptidase and glycylglycine dipeptidase were inhibited.

79-001492 Satake, N. TASK-SPECIFICITY OF THE BLOCKING ACTION OF PUROMYCIN ON RETENTION IN GOLDFISH. Physiol. Behav. 21 (6): 855-858. Dec. 1978. SFA 24(2)
[Lab. Sens. Sci., Univ. Hawaii, Honolulu 96822]

79-001493 Schaefer, C. H.; Dupras, E. F., Jr.; Stewart, R. J.; Davidson, L. W.; Colwell, A. E. THE ACCUMULATION AND ELIMINATION OF DIFLUBENZURON BY FISH. Bull. Environ. Contam. Toxicol. 21 (1/2): 249-254. Jan. 1979. SFA 24(2)
[Mosquito Control Res. Lab., Univ. Calif., 5544 Air Terminal Dr., Fresno 93727] Diflubenzuron is accumulated from water into fish tissues at levels up to 80 fold within 24 hr when fish are exposed to concentrations of 10 ppb. Within the concentration range of 1-10 ppb, the amount accumulated in a 24 hr exposure is proportional to concentration. After 24 to 48 hr exposure fish degrade and eliminate diflubenzuron and the excretory products are neither the parent compound nor p-chlorophenylurea. The amount of diflubenzuron remaining in fish tissues with time is dependent on the reduction of residue concentration in water; however, the potential for degradation and elimination is very great.--From results and discuss.

79-001494 Scheir, A.; Connell, W.; Gominger, H. D. A BIOASSAY LABORATORY BOAT WITH COMPARISONS OF CENTRAL VS. BOAT LABORATORY BIOASSAY EVALUATIONS. Water Resour. Bull. 15 (1): 75-87. Feb. 1979. SFA 24(2)
[Acad. Nat. Sci. Phila., 19th and the Parkway, Philadephia, PA 19103] A laboratory boat designed to investigate toxic effects on site and its use as a bioassay tool in the study of a refinery effluent discharged into the Schuylkill River, a tributary of the Delaware River, is described. Three-hundred thirty-six-hour continuous flow bioassays exposing the bluegill sunfish, the channel catfish, the tadpole snail, the grass shrimp, and the sheephead minnow to concentrations of refinery effluent in Schuykill, Delaware River, and Delaware Bay water, with and without the addition of sediment were performed. Results indicated that the toxicity (lethality) of fresh samples tested aboard the boat (refinery effluent, dilution water, sediment) were considerably higher (i.e., refinery effluent at full strength was 2.2X as lethal to the bluegill, 1.4X as lethal to the channel catfish, 4.5X as lethal to the sheephead minnow and 100X as lethal to the grass shrimp) than the same test material collected from the refinery outfall and brought to a central laboratory for testing. Chemical analysis and bioassy data is presented showing the effects of aging and irradiation upon the refinery effluent.

79-001495 Schnick, R. A.; Meyer, F. P.; VanMeter, H. D. ANNOUNCEMENT OF COMPOUNDS REGISTERED FOR FISHERY USES. Prog. Fish-Cult. 41 (1): 36-37. Jan. 1979. SFA 24(2)
[U.S.FWS, Natl. Fish. Res. Lab., La Crosse, WI]

79-001496 Shultz, C. D.; Ito, B. M. MERCURY AND SELENIUM IN BLUE MARLIN, /MAKAIRA NIGRICANS/, FROM THE HAWAIIAN ISLANDS. NOAA Fish. Bull. 76 (4): 872-879. 1979. SFA 24(2)
[NMFS, P.O. Box 3830, Honolulu, HI 96812]

79-001497 Sorensen, E. M. B.; Henry, R. E.; Ramirez-Mitchell, R. ARSENIC ACCUMULATION, TISSUE DISTRIBUTION AND CYTOTOXICITY IN TELEOSTS FOLLOWING INDIRECT AQUEOUS EXPOSURES. Bull. Environ. Contam. Toxicol. 21 (1/2): 162-169. Jan. 1979. SFA 24(2)
[Dep. Zool., Univ. Tex., Austin 78712]

79-001498 Spotila, J. R.; Paladino, V. F. TOXICITY OF ARSENIC TO DEVELOPING MUSKELLUNGE FRY (/ESOX MASQUINONGY/). Comp. Biochem. Physiol. C Comp. Pharmacol. 62 (1): 67-69. 1979. SFA 24(2)
[Dep. Biol., State Univ. Coll., Buffalo, NY 14222] The tolerance of young muskellunge (/Esox masquinongy/) fry to arsenic changed dramatically over the period of 12 weeks. Newly hatched fry in their inactive stage prior to swim up were insensitive to As concentrations as high as 5.0 mg/l. Fry undergoing swim-up had a 96-hr LC(50) value of 1.1 mg As/l, 5-week old fry had a LC(50) value of 2.6 mg As/l and 12-week old fry had a LC(50) value of 16.0 mg As/l. Acute sensitivity to toxic substances during sensitive stages in the life cycle of a fish, even if these stages are of short duration, may be the limiting factor in the ability of a species to survive chronic exposure to environmental contaminants.

79-001499 Tucker, C. S. CONSEQUENCES OF COPPER-SULFATE AND SIMAZINE TREATMENT FOR PHYTOPLANKTON CONTROL IN FISH PONDS AND STUDIES ON THE DISSIPATION OF SIMAZINE IN LABORATORY MICROCOSMS. Ph.D dissertation, Auburn Univ. 75p. 1978. From Diss. Abstr. Int. B Sci. Eng. 39(6): 2650. Dec. 1978. SFA 24(2)
Treatment of channel catfish (/Ictalurus punctatus/) production ponds biweekly with 0.84 kg/ha copper sulfate was ineffective in reducing phytoplankton density. Three periodic applications of simazine to the pond water totaling 1.3 mg/l drastically reduced phytoplankton density. Application of 13.4 kg/ha simazine to the bottoms of catfish ponds prior to flooding resulted in decreased chlorophyll /a/ values and a reduction in coverage by macrophytes. However, treatment of catfish ponds with simazine, either added to the water or as a preflooding treatment, resulted in extended periods of low dissolved oxygen concentrations, up to a 20 percent reduction in catfish yields, and poorer conversion of feed when compared to control ponds. A single application of 1.5 mg/l simazine to the water of fertilized bluegill (/Lepomis macrochirus/) ponds also decreased chlorophyll /a/ values, coverage by macrophytes, and dissolved oxygen concentrations. Bluegill yields were not affected significantly (P greater than 0.05). Laboratory studies showed that the presence of pond sediment greatly increased the rate of simazine loss when compared to systems containing pond water alone.

79-001500 Varanasi, U.; Gmur, D. J. INFLUENCE OF WATER-BORNE AND DIETARY CALCIUM ON UPTAKE AND RETENTION OF LEAD BY COHO SALMON (/ONCORHYNCHUS KISUTCH/). Toxicol. Appl. Pharmacol. 46 (1): 65-75. Oct. 1978. SFA 24(2)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

79-001501 Waiwood, K. G.; Beamish, F. W. H. THE EFFECT OF COPPER, HARDNESS AND PH ON THE GROWTH OF RAINBOW TROUT, /SALMO GAIRDNERI/. J. Fish Biol. 13 (5): 591-598. Nov. 1978. SFA 24(2)
Fish. Mar. Serv., Biol. Stn., St. Andrews, NB E0G 2X0, Canada] Rainbow trout (/Salmo gairdneri/) were held at a fixed ration and activity regime and were exposed to a number of copper, pH and hardness combinations. Growth rate, appetite and gross conversion efficiency were determined over three consecutive 10-day periods of exposure. Growth rate was most affected during the first 10 days of exposure and partial or complete recovery was observed thereafter. For a given pH, less copper was required to reduce growth by a given amount at low than at high levels of hardness. At a given hardness, copper-induced depressions in growth rate were more pronounced and recovery slower in a low than in a high pH. No distinction could be made among total soluble or extractable copper but predicted concentrations of six specific cupric ions varied with pH and hardness. Regression analysis indicated that only Cu^{2+} and $CuOH^{+}$ could be significantly correlated with growth rate.

79-001502 Westerman, A. G.; Birge, W. J. ACCELERATED RATE OF ALBINISM IN CHANNEL CATFISH EXPOSED TO METALS. Prog. Fish-Cult. 40 (4): 143-146. Oct. 1978. SFA 24(2)
[T. H. Morgan Sch. Biol. Sci., Univ. Ky., Lexington 40506]

79-001503 Witschi, W. A.; Ziebell, C. D. EVALUATION OF PH SHOCK ON HATCHERY-REARED RAINBOW TROUT. Prog. Fish-Cult. 41 (1): 3-5. Jan. 1979. SFA 24(2)
[Ariz. Coop. Fish. Res. Unit, Univ. Ariz., Tucson 85721]

79-001504 Woodward, D. F.; Mayer, F. L., Jr. TOXICITY OF THREE HERBICIDES (BUTYL, ISOOCTYL, AND PROPYLENE GLYCOL BUTYL ETHER ESTERS OF 2,4-D) TO CUTTHROAT TROUT AND LAKE TROUT. U.S. Fish Wildl. Serv. Tech. Pap. 97. 6p. 1978. SFA 24(2)
[U.S. FWS, Columbia Natl. Fish. Res. Lab., Jackson, WY 83001] Two formulations of the herbicide 2,4-D (2,4-dichlorophenoxyacetic acid)--the butyl ester (BE) and the propylene glycol butyl ether ester (PGBEE)-- had 96-h LC(50)'s to cutthroat trout (/Salmo clarki/) and lake trout (/Salvelinus namaycush/) ranging from 490 to 1,220 ug/l in static tests. A third formulation--the isooctyl ester (IE)--was not toxic to cutthroat trout or lake trout at concentrations below 60,000 ug/l. The butyl ester (2,4-D BE) was slightly more toxic than 2,4-D PGBEE, and the toxicity of both esters increased as water temperature decreased. Water hardness and pH did not affect the toxicity of the BE or PGBEE formulation. In chronic toxicity tests with cutthroat trout alevins, mortality increased in 44 ug/l BE and 60 ug/l PGBEE. Similar testing with lake trout resulted in increased alevin mortality and reduced fry growth in 60 ug/l of 2,4-D BE and 100 ug/l of 2,4-D PGBEE. On the basis of alevin survival and fry growth, we consider the maximum safe concentrations (ug/l) for chronic exposure to be 24 for BE and 31 for PGBEE in cutthroat trout and 33 for BE and 52 for PGBEE in lake trout. On the basis of effects of a 7-day static exposure on cutthroat trout, we suggest a concentration of 100 ug/l as the maximum permissible concentration of either formulation after a single field

79-001504 CONTINUED
application.

79-001505 Zitko, V.; Saunders, R. L. EFFECT OF PCBS AND OTHER ORGANOCHLORINE COMPOUNDS ON THE HATCHABILITY OF ATLANTIC SALMON (/SALMO SALAR/) EGGS. Bull. Environ. Contam. Toxicol. 21 (1/2): 125-130. Jan. 1979. SFA 24(2)
[Fish. Mar. Serv., Biol. Stn., St. Andrews, NB E0G 2X0, Canada]

RESEARCH AND MANAGEMENT-GENERAL

79-001506 Larkin, P. A. MAYBE YOU CAN'T GET THERE FROM HERE: A FORESHORTENED HISTORY OF RESEARCH IN RELATION TO MANAGEMENT OF PACIFIC SALMON. J. Fish. Res. Board Can. 36 (1): 98-106. Jan. 1979. In English with French summ. SFA 24(2)
[Inst. Anim. Resour. Ecol., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

79-001507 Marmelstein, A. , (general chairman) CLASSIFICATION, INVENTORY, AND ANALYSIS OF FISH AND WILDLIFE HABITAT. U.S. Fish Wildl. Serv. FWS/OBS-78/76. v + 604p. 1978(1977). SFA 24(2)
[U.S. FWS, Washington, DC]

79-001508 Spangler, G. R.; Berst, A. H. SUESTIONS AND ANSWERS ON SPLAKE. Ont. Fish Wildl. Rev. 17 (2): 3-8. 1978. SFA 24(2)
[Ontario Minist. Nat. Resour., Ottawa, ON, Canada]

79-001509 Van Velson, R. C. THE MCCONAUGHY RAINBOW...LIFE HISTORY AND A MANAGEMENT PLAN FOR THE NORTH PLATTE RIVER VALLEY. Nebr. Game Park Comm. Tech. Ser. No. 2. 83p. 1978. SFA 24(2)
[Nebr. Game Parks Comm., P.O. Box 30370, Lincoln 68503]

79-001510 Wallace, D. N. PROFFESSIONAL ETHICS IN APPLIED SCIENCE AND ENGINEERING. Fisheries (Bull. Am. Fish. Soc.) 3 (4): 16-21, 42. July-Aug. 1978. SFA 24(2)
[N.Y. Power Authority, 10 Columbus Cir., New York 10019]

79-001511 Warner, K.; Johnson, P. R. MORTALITY OF LANDLOCKED ATLANTIC SALMON (/SALMO SALAR/) HOOKED ON FLIES AND WORMS IN A RIVER NURSERY AREA. Trans. Am. Fish. Soc. 107 (6): 772-775. Nov. 1978. SFA 24(2)
[Me. Dep. Inland Fish. Wildl., Bangor 04401]

79-001512 Yorke, T. H. IMPACT ASSESSMENT OF WATER RESOURCE DEVELOPMENT ACTIVITIES: A DUAL MATRIX APPROACH. U.S. Fish Wildl. Serv. FWS/OBS-78/82. vi + 27p. Sept. 1978. SFA 24(2)
[U.S. FWS, Harpers Ferry Cent., Harpers Ferry, WV 25425]

ADMINISTRATION AND PLANNING

79-001513 Campbell, J. S. TYPES OF PARASTATAL BODIES CONCERNED WITH FISHERIES DEVELOPMENT AND THEIR FINANCIAL RESPONSIBILITIES. FAO Fish. Tech. Pap. No. 179. vi + 39p. 1978. SFA 24(2)
[3 Rakeiora Grove, Petone, New Zealand]

REPORTS OF FISHERY STATIONS, STATES, ETC.

79-001514 Alabama Department of Conservation and Natural Resources ANNUAL REPORT DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES. OCTOBER 1, 1977-SEPTEMBER 30, 1978. Ala. Dep. Conserv. Nat. Resour., Montgomery 44p. 1978. SFA 24(2)
[64 North Union St., Montgomery 36130]

79-001515 Idaho Department of Game ANNUAL REPORT OF THE DEPARTMENT OF FISH AND GAME OF THE STATE OF IDAHO. JULY 1, 1977 TO JUNE 30, 1978. Idaho Dep. Fish Game, Boise 83p. 1978. SFA 24(2)
[Boise 83720]

79-001516 New Hampshire Fish and Game Department 1977 ANNUAL REPORT. N.H. Fish Game Dep. vii + 72p. 1978. SFA 24(2)
[34 Bridge St., Concord 03301]

79-001517 Scott, D. P. , (ed.) BIENNAL REPORT FOR 1974-76: WESTERN REGION, FISHERIES AND MARINE SERVICE. Fish. Environ. Can. Fish. Mar. Serv. Tech. Rep. No. 813. vi + 33p. Dec. 1978. In English and French. SFA 24(2)
[Fish. Mar. Serv., Winnipeg, MB R3T 2N6, Canada]

HABITAT ALTERATION

79-001518 Armour, C. L. EFFECTS OF DETERIORATED RANGE STREAMS ON TROUT. U.S. Dep. Interior Bur. Land Manage., Boise, ID 7p. Aug. 1977. Available from Idaho State Office BLM, 550 W. Fort Street, Box 042, Boise 83724. SFA 24(2)
Improper management of domestic livestock on western ranges has caused habitat degradation of trout streams in some areas. As a result, there is either less trout production or conditons have deteriorated to such a degree that the fish can not survive in the streams. To accommodate requirements of sportsmen for additional fishing opportunities and to achieve national objectives for better balance in managing resources, it is necessary for habitat degradation problems to be solved. Livestock can alter the quality of stream habitat by damaging banks and decreasing the density of streamside vegetation. Bank damage, besides contributing to erosion and the alteration of channels, can eliminate important trout habitat associated with banks. When streamside vegetation is cropped unacceptably, erosion and sedimentation are promoted. If shading is decreased, water temperature can elevate to levels unsuitable for trout. Sedimentation can lessen trout reproductive success and the production of aquatic insects which are the predominant food base.

79-001518 CONTINUED
Solutions to trout habitat problems will have to be achieved through inter-disciplinary efforts. Fishery biologists, watershed specialists, range management specialists, plant ecologists and other proffesionals must become collectively involved to perfect habitat improvement methods. It will be essential for the livestock industry to cooperatively assist land management agencies to improve stream conditions once suitable approaches are developed.

79-001519 Bishop, K. A.; Bell, J. D. OBSERVATIONS ON THE FISH FAUNA BELOW TALLOWA DAM (SHOALHAVEN RIVER, NEW SOUTH WALES) DURING RIVER FLOW STOPPAGES. Aust. J. Mar. Freshwater Res. 29 (4): 543-549. Aug. 1978. SFA 24(2)
[New South Wales State Fish., P.O. Box N 211, Grosvenor St., Sydney, N.S.W. 2000, Australia]

79-001520 Bulkley, R. V.; Bachman, R. W.; Carlander, K. D.; Pierstine, H. L.; King, L. R.; Menzel, B. W.; Witten, A. L.; Zimmer, D. W. WARMWATER STREAM ALTERATIONS IN IOWA: EXTENT, EFFECTS ON HABITAT, FISH, AND FISH FOOD, AND EVALUATION OF STREAM IMPROVEMENT STRUCTURES (SUMMARY REPORT). U.S. Fish Wildl. Serv. FWS/OBS-76/16. v + 39p. July 1976. SFA 24(2)
[Iowa Coop. Fish. Res. Unit, Iowa State Univ., Ames 50011] This report summarized results given in 5 other subproject reports. Studies were conducted from 1973 to 1976 to determine the extent of stream channelization in Iowa, differences in populations of fish and fish-food organisms in channelized and unchannelized streams, effects of stream alterations for highway bridge construction, and the value of stream-bank stabilization structures to fish habitat. Over 1000 miles of stream capable of supporting permanent fish populations were lost in Iowa through stream channelization. Channelization resulted in more uniform water depth and current velocity in the resulting stream with a reduciton in habitat diversity. Sinuous streams had greater concentrations of drift organisms than did straightened channels. More species of fish were found in natural sections, Although fish were as abundant in short-reach sections (ca 0.5 km) channelized 10-15 years ago as in natural sections where ever brush piles and trees had accumulated in the stream. Certain structures installed in Iowa streams to protect highway bridges improved fish habitat by producing scour holes and providing cover and substrate for fish-food organisms. No additional long-reach (1.0 km) channelization should be conducted; effects of short reach projects can be lessened by leaving as much meander in the stream as possible and by proper placing and design of bank-stabilization structures.

79-001521 Crabtree, A. F.; Bassett, C. E.; Fisher, L. E. THE IMPACTS OF PIPELINE CONSTRUCTION ON STREAM AND WETLAND ENVIRONMENTS. Mich. Publ. Serv. Comm., Dep. Commerce, Lansing vii + 164p. 1978. SFA 24(2)
[Mich. Publ. Serv. Comm., 6545 Mercantile Way, Lansing 48910]

79-001522 Evans, A. K.; Uhleman, E. W.; Eby, P. A. ATLAS OF WESTERN SURFACE-MINED LANDS: COAL, URANIUM, AND PHOSPHATE. U.S. Fish. Wildl. Serv. FWS/OBS-78/20. 394p. Jan. 1978. SFA 24(2)
[NALCO Environ. Sci., 1500 Frontage Rd., Northbrook, IL 60062]

79-001523 Huish, M. T.; Pardue, G. B. ECOLOGICAL STUDIES OF ONE CHANNELIZED AND TWO UNCHANNELIZED WOODED COASTAL SWAMP STREAMS IN NORTH CAROLINA. U.S. Fish Wildl. Serv. FWS/OBS-78/85. x + 72p. Sept. 1978. SFA 24(2)

[N.C. Coop. Fish. Res. Unit. Box 5577 State Coll. Stn., 4105 Gardner Hall, Raleigh 27607] Chemical, physical, and biological components of three small cypress-gum wooded swamp streams of northeastern North Carolina were studied from 1973 to 1976. One of the streams was channelized in 1963. Several differences between the channelized and unchannelized systems were noted. Substrates of the channelized stream were largely mineral, those of the unchannelized streams were detrital. Dissolved oxygen, alkalinity, pH, summer daytime temperatures and velocity were higher in the channelized stream and its width was relatively restricted. Six cyprinid species collected in the channelized stream were not found in the unchannelized streams. Herring, swampfish, and flier were absent or rare in the channelized stream, but were present in the unchannelized streams. Weight of fish per unit area was higher during summer collections in the non-channelized streams than in the channelized stream, probably because of the larger area available for fish production at high water in the unchannelized streams. In the unchannelized streams low water periods were accompanied by low dissolved oxygen levels which precluded many species. Two periods of low oxygen occurred. One was associated with high temperatures and low flows in the summer; the other with low flows and leaf fall in early winter. Species and numbers of benthic and drift organisms varied with seasons and streams.

79-001524 Meehan, W. R.; Platts, W. S. LIVESTOCK GRAZING AND THE AQUATIC ENVIRONMENT. J. Soil Water Conserv. 33 (6): 274-278. Nov.-Dec. 1978. SFA 24(2)

[U.S. For. Serv., Pac. Northwest For. Range Exp. Stn., Corvallis, OR 97331]

79-001525 Miyazaki, C.; Sawada, T. [STUDIES ON VALUE JUDGMENT OF FISHING GROUNDS WITH NATURAL FISH REEFS AND ARTIFICIAL FISH REEFS. II. FISH-LURING EFFECT OF ARTIFICIAL FISH REEFS.] J. Fac. Mar. Sci. Technol. Tokai Univ. No. 11. p. 79-84. 1978. In Japanese with English summ. SFA 24(2)

Surveys were made on aritificial fish reefs to examine their fish-attraction effects from data on their number and scale, water depth in which they were placed, bottom topography, fish species attracted and information from fisherman catching such fish. Results are as summarized as follows: (1) Artificial fish reefs mainly for demersal fish were laid on sea-bed areas of slope 6/100 to 20/100, which extend to more than 300 m in depth. Artificial fish reefs cheifly for pelagic fish were placed on bottom areas of almost the same slope. However, their centers were located on the steep slope and the Kuroshio must come to this area. (2) Artificial fish reefs for whitebait were set on sea-bed areas with a gentle slope of 0.6/100 to 1/100 where boat seine fishing was taking place. (3) The catch per m^3 volume of an artificial fish reef popularly used in Shizuoka Perfecture was 0.2 to 113 kg.

79-001526 Miyazaki, C.; Sawada, T. [STUDIES ON VALUE JUDGEMENT OF FISHING GROUNDS WITH NATURAL FISH REEFS AND ARTIFICIAL FISH REEFS. I. RELATIONS BETWEEN NATURAL FISH REEFS AND ARTIFICIAL ONES.] J. Fac. Mar. Sci. Technol. Tokai Univ. No. 11. p. 71-78. 1978. In Japanese with English summ. SFA 24(2)

Surveys were conducted on natural and artificial fish reefs by means of diving, underwater photography, examination of their location by means of sea charts and of catches by species of fish. Results are summarized as follows: (1) Natural fish reefs adequate for luring migratory fish should be higher than 40 percent of the sea depth of about 45m and have a 60° slope with protrusions on its surface. (2) Pelagic catches in artificial fish reefs are greater than bottom catches, if the ratio of sea depth to height of natural reefs are large and there are natural reefs in the offing at a right angle to the isobath where the artificial reefs are placed.

79-001527 Nunnally, N. R. STREAM RENOVATION: AN ALTERNATIVE TO CHANNELIZATION. Environ. Manage. 2 (5): 403-411. Sept. 1978. SFA 24(2)

[Dep. Geogr. Earth Sci., univ. N.C., Charlotte 28228]

Channelization is one of the most common solutions to urban drainage problems, despite the fact that channelized streams are frequently morphologically unstable, biologically unproductive, and aesthetically displeasing. There is increasing empirical and theoretical evidence to suggest that channelization may be counterproductive unless channels are designed to prevent the bank erosion and channel silting that often accompanies stream dredging. Many of the detrimental effects of channelization can be avoided, with little compromise in channel efficiency, by employing channel design guidelines that do not destroy the hydraulic and morphologic equilibria that natural streams possess. These guidelines include minimal straightening; promoting bank stability by leaving trees, minimizing channel reshaping, and employing bank stabilization techniques; and, emulating the morphology of natural stream channels. This approach, called stream restoration or stream renovation, is being successfully employed to reduce flooding and control erosion and sedimentation problems on streams in Charlotte, North Carolina.

79-001528 Ogawa, Y. [PROBLEMS OF ARTIFICIAL REEFS FOR PROPAGATION OF FISH IN SHALLOW WATER.] In S. Motoda, ed. Propagation of Marine Resources of the Pacific Ocean. First Japan-USSR Joint Symp. Aquacult. Pac. Ocean: 1-4 Dec. 1972, Tokyo and Shimizu, Japan. p. 83-91. Sept. 1973. In Japanese with English summ. SFA 24(2)

[Tokai Reg. Fish. Res. Lab., Fish. Agency, Tokyo, Japan]

79-001529 Ramberg, L. EFFECTS OF FORESTRY OPERATIONS ON AQUATIC ECOSYSTEMS. Ecol. Bull. (Stock.) 21: 143-149. 1976. SFA 24(2)

The effects of various forest-management practices on the water quality of streams and lakes are presented, as well as possible responses by various aquatic forms of life. The most important effects are: increased runoff and particulate transport (clear-felling, drainage), increased water temperature (clear-felling), increased nitrification and nitrogen leaching (clear-felling, forest fertilization), increased phosphorus leaching (clear-felling, bog fertilization) and a lowered pH (clear-felling, drainage, forest fertilization, exclusive favorization of conifers).

79-001530 Sabean, B. THE EFFECTS OF SHADE REMOVAL ON STREAM TEMPERATURE IN NOVA SCOTIA. Nova Scotia Dep. Land For. Cat./77/135/150. 31p. 1977. SFA 24(2)

[Nova Scotia Dep. Land For., Halifax, NS B3J 2T9, Canada] The data from 1975 and 1976, indicate that canopied streams in Nova Scotia generally provide near optimal temperature conditions during the critical summer months. Canopy removal results in significant increases and some streams may exceed 25°C during the warmest parts of the day. Rate of increase depends on the size of the stream, substrate and flow volume. Re-entry into a canopied section results in a decrease in temperature, but at a much slower rate and it may never return to its original level. The rate of decrease depends on spring action, air temperature, ground temperature, rate of flow and volume of flow. Diurnal fluctuations can be very substantial in clearcut areas but the fluctuations themselves are probably not directly harmful to the fish. Greenbelts of sufficient width to shade the streams provide excellent protection and it is through their use that adequate water temperatures for salmonid production can be maintained in Nova Scotia.--Summ.

HARVEST, CREEL CENSUS

79-001531 Bender, R. E.; McGie, A. M. THE HARVEST OF HATCHERY AND WILD FALL CHINOOK SALMON IN 1974 FROM ELK RIVER, OREGON. Oreg. Dep. Fish Wildl. Inf. Rep. Ser. Fish. No. 78-6. 17p. Dec. 1978. SFA 24(2)

[Oreg. Dep. Fish. Wildl., Cape Blanco Rt., Box 1, Sixes 97476] The sport fishery in Elk River was surveyed from October 19 to December 31, 1974, to estimate the total harvest of hatchery and wild fall chinook salmon (/Oncorhynchus tshawytscha/), angling effort, and effects of a 1-month extension of the season during December. Creel survey personnel interviewed 2,547 anglers in 1974. Based upon these interviews, the estimated effort was 39,866 angler hours, 17,694 in the regular season (October and November) and 22,172 in December. The estimated sport harvest of 2,471 fall chinook salmon contained 1,964 hatchery fish and 507 wild fish. An estimated 1,197 hatchery chinook and 357 wild chinook were harvested during the regular seascn compared to 767 hatchery fish and 150 wild fish in the December season extension. The average catch rate was 16.1 hours/fall chinook or 0.22 chinook/angler day. Anglers caught 26 percent of the total fall chinook population entering Elk River in 1974. Extending the angling season through December was a successful tactic to increase the harvest of late-migrant, adult chinook salmon produced by Elk River Hatchery.

79-001532 FAO of the UN REPORT OF THE FOURTH SESSION OF THE IPFC/IOFC JOINT WORKING PARTY OF EXPERTS ON INDIAN OCEAN AND WESTERN PACIFIC FISHERY STATISTICS. FAO Fish. Rep. No. 189. iv + 15p. Jan. 1977. SFA 24(2)

[Rome, Italy]

79-001533 Kolenosky, D. P. LAKE ONTARIO SALMON ANGLER SURVEY. Ont. Fish Wildl. Rev. 17 (2): 23-24. 1978. SFA 24(2)

79-001534 Ziemer, R. F.; Musser, W. N. THE DEMAND FOR AND VALUE OF WILDLIFE RECREATION IN GEORGIA. Univ. Ga. Agric. Exp. Stn. Res. Bull. 221. 31p. June 1978. SFA 24(2)
[Dep. Agric. Econ., Univ. Ga., Athens 30602]

MARKING AND TAGGING

79-001535 Arnold, G. P.; Holford, B. H. THE PHYSICAL EFFECTS OF AN ACOUSTIC TAG ON THE SWIMMING PERFORMANCE OF PLAICE AND COD. J. Cons. Cons. Int. Explor. Mer 38 (2): 189-200. Nov. 1978. SFA 24(2)
[Fish. Lab., Lowestoft, Suffolk NR33 OHT, England] Drag measurements in a small flume show that the Vitson-West transponding acoustic tag developed at the Fisheries Laboratory, Lowestoft, has a frontal drag coefficient C(D0)=0.6. For fish moving at constant speed the ratio of fish drag to tag drag is given by D/d=0.82L²C(D), where D(D) is an appropriate drag coefficient for the fish and L its length in cm. Acoustically tagged plaice, /Pleuronectes platessa/ (36-52 cm length), and cod, /Gadus morhua/ (50-70 cm length), tracked by sector-scanning sonar in the southern North Sea have been observed to swim at speed of 1 to 2 L s^{-1} through the water. Calculations with theoretical and experimental values of C(D) show that the smallest of these fish could have been slowed down by 7 percent and the majority by rather less than 5 percent. The extra power output required for a tagged fish to maintain the same steady speed as an untagged fish is between 3 percent and 5 percent and to maintain the same constant rate of acceleration less than 1 percent. The results suggest that the swimming performance of plaice and cod observed by sector-scanning sonar is unlikely to have been affected in any significant way by the addition of the acoustic tag.

79-001536 Hankin, D. G. NEW FLUORESCENT FISH SCALE MARKER. Prog. Fish-Cult. 40 (4): 163-164. Oct. 1978. SFA 24(2)
[Dep. Fish., Sch. Nat. Resour., Humboldt State Univ., Arcata, CA 95521]

79-001537 Joswiak, G. R.; Eisenhrey, A. B.; Moore, W. S. REJECTION OF DIAZO TAG IN CYPRINIDS. Prog. Fish-Cult. 40 (4): 146-147. Oct. 1978. SFA 24(2)
[Dep. Biol., Wayne State Univ., Detroit, MI 48202]

79-001538 Ryan, P. A. FISH TAGGING WITH INJECTED DYES. Mauri Ora 3: 55-61. 1975. SFA 24(2)
[Dep. Zool., Univ. Canterbury, Christchurch, New Zealand]

STOCKING AND INTRODUCTIONS

79-001539 Ebel, W. J. EFFECT OF DOWNSTREAM TRANSPORTATION OF IDAHO SMOLTS ON ADULT SALMONID RETURNS. Ph.D dissertation, Univ. Idaho 47p. 1978. From Diss. Abstr. Int. B Sci. Eng. 39(6):2620. Dec. 1978. SFA 24(2)

Chinook salmon (/Oncorhynchus tshawytscha/) and steelhead (/Salmo gairdneri/) were captured at Little Goose Dam in the Snake River during their seaward migration and transported 400 km downstream to the lower Columbia River below Bonneville Dam. Their survival was increased from 10 to 1,500 percent as compared to control fish which passed by 7 mainstem low-level dams and reservoirs. Variations in survival were dependent on species and evironmental conditions in the river during transport. The homing ability of the adult fish was not significantly diminished, less than 0.2 percent of strays were noted among adult returns from groups transported. Transportation did not affect ocean age or size of returning adults. Steelhead returned to Little Goose Dam at a substantially higher rate (1.4-2.7 percent) than chinook salmon (0.1-0.8 percent) from groups transported. The timing of adult returns to Little Goose Dam was not related to the time of capture and downstream release of smolts.

79-001540 Gowing, H. SURVIVAL, GROWTH, AND PRODUCTION OF DOMESTIC AND ASSINICA STRAIN BROOK TROUT IN FOUR MICHIGAN LAKES. Mich. Dep. Nat. Resour. Fish. Res. Rep. No. 1862. 19p. 27 Oct. 1978. SFA 24(2)

[Mich. Dep. Nat. Resour., East Lansing] In fall 1973, matched plantings of domestic and Assinica strain brook trout fingerlings of the 1973 year class were stocked in three small oligotrophic lakes and one shallow flowage. Stocking rate was 125 fish per hectare for each strain or 250 fish per hectare for each lake. Populations of trout were monitored annually in fall for 4 years after stocking. Nearly 98 percent of the Assinica trout were lost in the flowage during their first year after stocking from unknown causes. In a meromictic lake all trout died in the third winter as the result of a winterkill. For the remaining two lakes, domestic trout survived through age IV in both and a few are expected to survive an additional year whereas Assinica trout survived through age IV in one lake. Growth rate of Assinica trout was superior to that of domestic trout in all lakes. Growth rate was sustained best in the lake containing minnows. More than one-half of the domestic trout were sexually mature at age I; most had reached maturity at age II to age IV. For Assinica trout, only a few precocious males were mature at age II and about 62 percent of the females were mature at age III. In the two lakes where trout survived best, 4-year production of Assinica trout in one lake (46.89 kg/ha) exceeded that for domestic trout (39.03 kg/ha) while domestic trout production (48.28 kg/ha) was greater than Assinica trout production (45.52 kg/ha) in the other lake. The superior growth of Assinica trout over domestic trout provides an opportunity for improving the stocks of brook trout in the Michigan hatchery system and ultimately the catch of more desirable size trout by anglers.--from abstr.

79-001541 Henderson, E. B. COST:BENEFIT EVALUATION OF STOCKING HARVESTABLE-SIZED CATFISHES. Annu. Proc. Tex. Chap. Am. Fish. Soc. 1: 36-48. 1979[1978]. SFA 24(2)
[Lower Colo. River Auth., Lake Bastrop, Bastrop, TX 78602]

79-001542 Morgan, M. D.; Threlkeld, S. T.; Goldman, C. R. IMPACT OF THE INTRODUCTION OF KOKANEE (/ONCORHYNCHUS NERKA/) AND OPOSSUM SHRIMP (/MYSIS RELICTA/) ON A SUBALPINE LAKE. J. Fish. Res. Board Can. 35 (12): 1572-1579. Dec. 1978. In English with French summ. SFA 24(2)
[Inst. Ecol., Univ. Calif., Davis 95616]

79-001543 Pedley, R. B.; Jones, J. W. GROWTH AND SURVIVAL OF ATLANTIC SALMON (/SALMO SALAR/) IN ILYN DWYTHWCH, NORTH WALES. Freshwater biol. 8 (5): 423-431. Oct. 1978. SFA 24(2)
[Dep. Zool., Life Sci. Bldg., Univ. Liverpool, Crown St., P.O. Box 147, Liverpool L69 3BX, England] Altlantic salmon fry have been annually stocked into Llyn Dwythwch, North Wales, since 1969, in an attempt to increase the natural stocks of the area. The growth and survival of 1- and 2-year-old salmon were investigated, and compared with that of other lake-reared populations and also with salmon in the natural stream environment. Lake-reared salmon follow the same patterns of slow and rapid growth as found for river fish, but the growth rate was superior in the former. The variation in length-weight relationship with age and sex was investigated. Survival rate in general compared favourably with the survival in rivers, with high mortality rates of salmon in Llyn Dwythwch resulting from predation at spring stocking by the resident brown trout. This was later avoided by stocking larger fish in the autumn.

79-001544 Purych, P. R. A CASE AGAINST STOCKING. Ont. Fish Wildl. Rev. 16 (2): 3-5. 1977. SFA 24(2)
[Ontario Minist. Nat. Resour., Blind River Dist., ON, Canada]

79-001545 Shearer, K. D.; Mulley, J. C. THE INTRODUCTION AND DISTRIBUTION OF THE CARP, /CYPRINUS CARPIO/ LINNAEUS, IN AUSTRALIA. Aust. J. Mar. Freshwater Res. 29 (5): 551-563. Oct. 1978. SFA 24(2)
[J.C. Mulley: Cytogenet. Unit, Dep. Histopathol., Adelaide Children's Hosp., North Adelaide, Australia 5006] The introduction and distribution of the carp, /C. carpio/, in Australia are examined. Historical reports, standard taxonomic techniques, and protein electrophoresis indicate that at least three distinct populations of carp exist in Australia and that one population has hybridized with the goldfish /Carassius auratus/.

79-001546 Wagner, W. C.; Stauffer, T. M. SURVIVAL OF RAINBOW TROUT STOCKED IN A LAKE SUPERIOR TRIBUTARY, 1971-1973. Mich. Dep. Nat. Resour. Fish. Res. Rep. No. 1859. 18p. 29 Sept. 1978. SFA 24(2)
[Mich. Dep. Nat. Resour., East Lansing] Experimental plantings of marked domestic rainbow trout (30,000) and steelhead (30,000) were made in the Huron River near its mouth in May and June 1971-1973. Domestic trout were 19-month-old progeny of fall-spawning broodstock held in a hatchery and steelhead were 13-month-old progeny of spring-spawning wild trout from Lake Michigan. The purposes of the plants were to compare returns of adult domestic and steelhead to the angler, assess results of "imprinting" and determine the effect of differences in water hardness between the hatchery and receiving water on early survival of planted trout. Known returns of adult trout to anglers were virtually nil (0.005 percent) as were estimated returns (0.06

79-001546 CONTINUED
percent). Other plantings of rainbow trout in Lake Superior tributaries have produced equally dismal results. The causes of the low return in our study were not identified, but stresses due to time in transit and transfer from hard (130-172 ppm, total hardness) to soft water (40 ppm) seemed to be contributing factors. For trout in transit for 9 to 13.5 hours from the Platte River (160 ppm) and Oden (172 ppm) hatcheries, mortality for about 1 week after planting was 9-32 percent. In contrast, trout in transit for 5 hours from Thompson Hatchery (130 ppm) had no mortality for a comparable length of time. However, stress of transportation and water hardness change does not seem to be the entire answer because survival to adulthood for Thompson trout was also nil. We recommend that stocking of rainbow trout in Lake Superior tributaries be terminated until the causes of the low return are determined and corrected.--from Abstr.

FISHING GEAR AND TECHNIQUES

79-001547 De Jesus, A. S. A REPORT ON THE DESIGN, CONSTRUCTION, AND OPERATION OF THE GERMAN (HERMANN ENGEL TYPE) TRAWL NET IN MANILA BAY. Philipp. J. Fish. 14 (1): 117-144. Jan.-June 1976. SFA 24(2)
[Bur. Fish. Aquatic Resour., Manila, Philippines]

79-001548 Gorman, O. T.; Karr, J. R. HABITAT STRUCTURE AND STREAM FISH COMMUNITIES. Ecology 59 (3): 507-515. 1978. SFA 24(2)
[Mus. Nat. Hist., Univ. Kans., Lawrence 66045] Stream habitat complexity is correlated with fish species diversity in selected Indiana and Panama streams. Habitat diversity was measured along 3 dimensions judged important to a wide range of fish groups and applicable to many stream conditions: stream depth, bottom type, and current. Increasing community habitat diversity followed stream-order gradients. Natural streams supported fish communities of high species diversity which were seasonally more stable than the lower-diversity communities of modified streams. After disturbances such as channelization, seasonal peaks in species diversity attain levels typical of undisturbed streams. Because seasonal changes in stream quality are high, the stability of the fish community is lower in modified than in natural streams. The general correlation between habitat characteristics and presence and absence of fish species suggests that most fishes of small streams are habitat specialists.

79-001549 Heisey, P. G. TECHNIQUE FOR COLLECTING FISH WITH A BLOCK NET IN A PUMPED STORAGE RESERVOIR. Prog. Fish-Cult. 40 (4): 155-157. Oct. 1978. SFA 24(2)
[Muddy Run Ecol. Lab., Radiation Manage. Corp., Drumore, PA 17518]

79-001550 Hettler, W. F. MODIFIED NEUSTON NET FOR COLLECTING LIVE LARVAL AND JUVENILE FISH. Prog. Fish-Cult. 41 (1): 32-33. Jan. 1979. SFA 24(2)
[NMFS, Southeast Fish. Cent., Beaufort Lab., Beaufort, NC 28516]

79-001551 Honda, K. [PROPERTIES OF NETTING TWINES UNDER CYCLIC TENSILE LOADING.] Bull. Jpn. Soc. Sci. Fish. 44 (12): 1295-1307. Dec. 1978. In Japanese with English summ. SFA 24(2)
[Tokyo Univ. Fish., Konan 4-5-7, Minato-ku, Tokyo 108, Japan]

79-001552 Kohler, C. C.; Ney, J. J.; Nigro, A. A. COMPACT, PORTABLE VERTICAL GILL NET SYSTEM. Prog. Fish-Cult. 41 (1): 34-35. Jan. 1979. SFA 24(2)
[Dep. Fish. Wildl. Sci., VPI & SU, Blacksburg, VA 24061]

79-001553 Leithiser, R. M.; Ehrlich, K. F.; Thum, A. B. COMPARISON OF A HIGH VOLUME PUMP AND CONVENTIONAL PLANKTON NETS FOR COLLECTING FISH LARVAE ENTRAINED IN POWER PLANT COOLING SYSTEMS. J. Fish. Res. Board Can. 36 (1): 81-84. Jan. 1979. In English with French summ. SFA 24(2)
[Lockheed Cent. Mar. Res., Carlsbad, CA 92008]

79-001554 McCleneghan, K.; Houk, J. L. A DIVER-OPERATED NET FOR CATCHING LARGE NUMBERS OF JUVENILE MARINE FISHES. Calif. Fish Game 64 (4): 305-307. Oct. 1978. SFA 24(2)
[Calif. Dep. Fish Game, 2201 Garden Rd., Monterey 93940]

79-001555 Swan, G. A.; Krcma, R. F.; Farr, W. E. DIP BASKET FOR COLLECTING JUVENILE SALMON AND TROUT IN GATEWELLS AT HYDROELECTRIC DAMS. Prog. Fish-Cult. 41 (1): 48-49. Jan. 1979. SFA 24(2)
[NMFS, Big Pasco Industrial Park, Bldg. 900, Pasco, WA 99301]

FERTILIZATION OF WATER AND SOIL

79-001556 LeBrasseur, R. J.; McAllister, C. D.; Barraclough, W. E.; Kennedy, O. D.; Manzer, J.; Robinson, D.; Stephens, K. ENHANCEMENT OF SOCKEYE SALMON (/ONCHORHYNCHUS NERKA/) BY LAKE FERTILIZATION IN GREAT CENTRAL LAKE: SUMMARY REPORT. J. Fish. Res. Board Can. 35 (12): 1580-1596. Dec. 1978. In English with French summ. SFA 24(2)
[Fish. Mar. Serv., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

FISHWAYS, FISH PASSAGE THROUGH DAMS, ETC.

79-001557 Beach, M. H. THE USE OF INFRA-RED LIGHT AND CLOSED CIRCUIT TV TO VALIDATE RECORDS FROM AUTOMATIC FISH COUNTERS. J. Fish Biol. 13 (5): 639-644. Nov. 1978. SFA 24(2)
[Salmon & Freshwater Fish. Lab., Minist. Agric. Fish. Food, 10 Whitehall Place, London SW1 2HE, England] Infra-red light was used to provide 'dark' illumination for a TV surveillance system to check the performance of an automatic migratory fish counter. The transmission characteristics of water and infra-red filters was examined together with the response of TV camera tubes and fish to radiation at infra-red wavelengths.

79-001558 Bowles, R. R.; Merriner, J. V.; Boreman, J. FACTORS AFFECTING ACCURACY OF ICHTHYOPLANKTON SAMPLES USED IN POWER PLANT ENTRAINMENT STUDIES. U.s. Fish Wildl. Serv. FWS/OBS-76/20.7. 12p. June 1978. SFA 24(2)

[Va. Inst. Mar. Sci., Gloucester Point 23062] Sampling programs designed to assess impact of power plants on ichthyoplankton populations are subject to multiple sources of error that may affect reliability and applicability of the data. Gear currently used to sample ichthyoplankton are discussed, and abiotic and biotic factors that may prevent these gear from attaining "representative" samples are identified. A check list of items which should be considered in evaluation of existing or proposed programs to sample ichthyoplankton is provided.

79-001559 Katopodis, C.; Robinson, P. R.; Sutherland, B. G. A STUDY OF MODEL AND PROTOTYPE CULVERT BAFFLING FOR FISH PASSAGE. Fish. Environ. Can. Fish. Mar. Serv. Tech. Rep. No. 828. v + 78p. Dec. 1978. In English with French summ. SFA 24(2)

[Fish. Mar. Serv., Winnipeg, MB R3T 2N6, Canada] Most streams, crossed by roads or highways, are culverted. Many such crossings are impassable to migrating fish because of the culvert length and the high water velocities in them. A hydraulic model study tested and developed devices to aid fish passage through culverts. Based on the model study recommendations, Offset baffles and Spoiler baffles were designed and installed at the Mackenzie Highway crossing of the Redknife River. Field testing showed good agreement, between model and prototype results. The effectiveness of both baffle types is inversely proportional to culvert slope. Maximum recommended slope is 5 percent. A method of judging baffle adequacy is provided. The Offset and Spoiler baffles are recommended, primarily for correcting existing culvert installations and for proposed stream crossings where alternative designs are neither practical nor economical. Minor problems were presented by ice, debris and sediment. Unsuccessful attempts by Arctic grayling and longnose sucker, to enter the Redknife River culverts, were observed; their failures were attributed to overwhelming water velocities associated with elevated culvert outlets.

79-001560 Kelso, J. R. M.; Leslie, J. K. ENTRAINMENT OF LARVAL FISH BY THE DOUGLAS POINT GENERATING STATION, LAKE HURON, IN RELATION TO SEASONAL SUCCESSION AND DISTRIBUTION. J. Fish. Res. Board Can. 36 (1): 37-41. Jan. 1979. In English with French summ. SFA 24(2)

[Dep. Fish. Oceans, Great Lakes Biolimnol. Lab., Sault Ste. Marie, ON P6A 2B3, Canada]

79-001561 Layzer, J. B. TRANSPORTATION OF ADULT AMERICAN SHAD PAST DAMS ON THE CONNECTICUT RIVER, MASSACHUSETTS, 1973-76. Prog. Fish-Cult. 41 (1): 7-9. Jan. 1979. SFA 24(2)

[Okla. Coop. Fish. Res. Unit, Okla. State Univ., Stillwater 74074]

79-001562 Powell, D. H.; Spencer, S. L. A SPILLWAY BARRIER FOR PONDS AND LAKES. Ala. Conserv. 49 (1): 20-21. Jan.-Feb. 1979. SFA 24(2)

[Ala. Dep. Conserv. Nat. Resour., Marion]

79-001563 Whitfield, P. E.; Kolenosky, D. P. PROTOTYPE EEL LADDER IN THE ST. LAWRENCE RIVER. Prog. Fish-Cult. 40 (4): 152-154. Oct. 1978. SFA 24(2)
[Ontario Minist. Nat. Resour., Kemptville, ON K0G 1J0, Canada]

MATHEMATICS, STATISTICAL METHODS AND MODELING

79-001564 Agnew, T. T. OPTIMAL EXPLOITATION OF A FISHERY EMPLOYING A NON-LINEAR HARVESTING FUNCTION. Ecol. Model. 6 (1): 47-57. Jan. 1979. SFA 24(2)
[Dep. Math., Univ. West. Aust., Nedlands, W.A. 6009, Australia] A harvesting function is developed to describe the rate of removal of fish from a fish population. The function incorporates the effects of both the handling or processing time of the catch and the competition, between boats in the fleet, for the fish. We will assume that the growth rate of the fish population can be modelled with a concave, dome shaped growth curve. With this assumption, it has been shown that if the rate of harvesting the fish is linearly related to both effort (which can be thought of as some measure of the number of boats in the fleet) and the population size, then the population will tend towards a single equilibrium level which is globally stable. This paper shows that the saturation effects due to the handling time may generate two equilibrium levels (one stable, one unstable) rather than a single globally stable equilibrium. The results of competition between boats are economically undesirable because of the decrease in efficiency. However, this competition may be beneficial to the exploited fish population. Using the harvesting model derived earlier, the steady state or long term optimal harvesting policies as well as the transition paths to these states are developed. The only constraint is on the maximum allowable effort which is effectively an upper limitation on the fleet size or number of man-hours of fishing.

79-001565 Dyer, T. G. J.; Gillooly, J. F. SIMULATING FISH PRODUCTION USING EXPONENTIAL SMOOTHING. Ecol. Model. 6 (1): 77-87. Jan. 1979. SFA 24(2)
[Dep. Geogr., Univ. Witwatersrand, Johannesburg, South Africa] The variation over time of the total annual production of pelagic fish for South Africa and the United Kingdom has been described quantitatively using the exponential smoothing technique. The exercise was repeated on annual mackerel landings for the same two countries. It is suggested that in some cases, the production figure for the current year can be used to simulate the following year's value. The greater variations in South Africa's annual production probably gave rise to the poorer results for these data.

79-001566 Goh, B. S. OPTIMUM SIZE LIMIT FOR A FISHERY WITH A LIMITED FISHING SEASON. Ecol. Model. 3 (1): 3-15. Feb. 1977. SFA 24(2)
[Math. Dep., Univ. West. Aust., Nedlands, WA 6009, Australia] In the management of a fishery with many year-classes, a standard objective is to maximize the biomass yeild. If the fishing effort is fixed, this objective can be attained by prescribing an optimum size limit. This implies that only fish which are larger than the optimum size limit should be caught. The theory for computing the optimum size limit when fishing is carried out continuously is well established. In contrast the theory for computing the optimum size limit when the fishing season is limited to the same period in each year has not been developed in spite of the fact that many fisheries are exploited in

79-001566 CONTINUED
this manner. A fishing season may be limited because the weather or the migration patterns of the fish population permits fishing only during a certain period in the year. A fishing season may also be limited because it is necessary to reduce the fishing mortality in order to conserve the fish population. A theory for computing the optimum size limit when the fishing season is limited is developed in this paper. It is applied to a hypothetical fishery. The data for this example comes from the North Sea plaice fishery. It is found that for a given fishing effort the optimum size limit is 44.5 cm if fishing is carried out continuously, 41.3 cm if fishing is limited to 6 months in a year and 28.7 cm if fishing is limited to a period of one tenth of a year in each year.

79-001567 McKellar, H. N., Jr. METABOLISM AND MODEL OF AN ESTUARINE BAY ECOSYSTEM AFFECTED BY A COASTAL POWER PLANT. Ecol. Model. 3 (2): 85-118. May 1977. SFA 24(2)
[B.W. Baruch Inst. Mar. Biol. Coast. Res., Univ. S.C., Columbia 29208]

79-001568 Schneider, J. C. PREDICTING THE STANDING CROP OF FISH IN MICHIGAN LAKES. Mich. Dep. Nat. Resour. Fish. Res. Rep. No. 1860. 10p. 25 Oct. 1978. SFA 24(2)
[Mich. Dep. Nat. Resour., East Lansing] Data on the standing crop of fish in Michigan lakes were reanalyzed using multiple correlation and regression techniques. A model previously used to successfully predict fish harvest rates also gave improved predictions of fish standing crops. However, the best model tested, explaining 56 percent of the variation in fish crops, included these parameters: panfish index, climate index, 1 divided by log(10) Secchi disk transparency, log(10) vegetation index, log(10) area, and rough fish index. This model is much better than the first, and appears to give reasonalbe and useful predictions.

79-001569 Sherr, C. A. A PRELIMINARY ECOSYSTEM MODEL OF PERTURBATIONS IN A TROPICAL SHALLOW WATER FISHERY. Ph.D dissertation, Univ. Ga. 232p. 1978. From Diss. Abstr. Int. B Sci. Eng. 39(6):2649. Dec. 1978. SFA 24(2)

ACCESS

79-001570 Templer, O. W. PROBLEMS OF PUBLIC ACCESS TO WATER IN TEXAS LAKES AND STREAMS: AN ANALYSIS. Proj. Compl. Rep. OWRT Proj. No. A-042-TEX, Tex. Tech Univ., Lubbock WRC 79-1. vi + 126p. Jan. 1979. SFA 24(2)
[Dep. Geogr., Texas Tech Univ., Lubbock]

LAKE MANAGEMENT & RESEARCH

79-001571 Eggers, D. M.; Bartoo, N. W.; Rickard, N. A.; Nelson, R. R.; Wissmar, R. C.; Burgner, R. L.; Devol, A. H. THE LAKE WASHINGTON ECOSYSTEM: THE PERSPECTIVE FROM THE FISH COMMUNITY PRODUCTION AND FORAGE BASE. J. Fish. Res. Board Can. 35 (12): 1553-1571. Dec. 1978. In English with French summ. SFA 24(2)
[Fish. Res. Inst., Coll. Fish., Univ. Wash., Seattle 98195]

79-001572 Gater, R.; Nantias, M. TRAWLING FOR DOLLARS. Ont. Fish Wildl. Rev. 16 (2): 17-19. 1977. SFA 24(2)
[Ontario Minist. Nat. Resour., Chatham Dist., ON, Canada]

79-001573 Marten, G. G. PREDATOR REMOVAL: EFFECTS ON FISHERIES YIELDS IN LAKE VICTORIA (EAST AFRICA). Science 203 (4381): 646-648. 16 Feb. 1979. SFA 24(2)
[Environ. Policy Inst., East-West Cent., Honolulu, HI] Lake Victoria's artisanal fishery has an overfishing problem. A possible solution is suggested by records showing that fish catches are best where predator populations have been reduced by fishing. It may be possible to remedy overfishing by increasing fishing effort, provided the additional effort is directed toward predators.

79-001574 Priegel, G. R.; Wirth, T. L. LAKE STURGEON POPULATIONS, GROWTH, AND EXPLOITATION IN LAKES POYGAN, WINNECONNE, AND LAKE BUTTE DES MORTS, WISCONSIN. Wis. Dep. Nat. Resour. Tech. Bull. No. 107. 23p. 1978. SFA 24(2)
[Wis. Dep. Nat. Resour., Box 7921, Madison 53707] Studies on Lakes Poygan, Winneconne and Butte des Morts from 1952-76 were designed to determine harvest, growth and population structure of lake sturgeon. The intent was to investigate whether overexploitation, a problem that this long-lived, late-maturing fish cannot survive, had occurred on these lakes and to adjust management if necessary. Lake sturgeon in the upriver lakes have shown a decline. Overharvest of the lake sturgeon population has occurred and was demonstrated by a decrease in the number of fish speared per individual fisherman; an increase in the harvest of small sturgeon (under 50 inches) and a decrease in the harvest of larger size classes; a downward trend in the age of harvested fish; and changes in mortality rates. Management alternatives include maintaining the present season, limiting fishing pressure and regulating through minimum size limits.

RIVER AND STREAM MANAGEMENT & RESEARCH

79-001575 Duff, D. A.; Cooper, J. L. TECHNIQUES FOR CONDUCTING STREAM HABITAT SURVEYS ON NATIONAL RESOURCE LAND. U.S. Dep. Interior Bur. Land Manage. Tech. Note 283. 73p. June 1976. Available from DSC, Fed. Cent. Bldg. 50, Denver, CO 80225]
[Bur. Land Manage., 136 East South Temple, Salt Lake City, UT 84111]

79-001576 Goulding, M. THE ECOLOGY AND MANAGEMENT OF THE RIO MADEIRA FISHERIES. Ph.D dissertation, Univ. Calif. (Los Angeles) 341p. 1978. From Diss. Abstr. Int. B Sci. Eng. 39(6):2643. Dec. 1978. SFA 24(2)

The fisheries of the upper three-fourths of the Rio Madeira basin are analyzed quantitatively and qualitatively. A sociocultural background to the study region is presented, and this is followed by a review of the biophysical bases of the fisheries. The fisheries themselves are examined from the standpoint of the exploitation of the following important biotopes: cataracts, tributary river-mouths, large clearwater affluents, rainforest streams, flooded forest and the main river itself. Catch per unit of effort and yield data are presented for each of the main biotopes exploited. The distribution, ecology and seasonal exploitation of the most important food fish species are discussed in some detail, and finally, recommendations are made for their management. The conclusions drawn from the investigation are: 1) sustained yields of the most important food fish species have probably already been attained, and the Rio Madeira fisheries will only be able to supply a small percentage of the animal protein required by the rapidly growing city of Porto Velho; 2) the siluroid (catfish) fisheries play only a small role in the local protein supply, as most of these catches are exported to southern Brazil, and 3) unless a management program is soon implemented, the Rio Madeira fisheries will be threatened by over-exploitation.

79-001577 Pruitt, T. A.; Nadeau, R. L. RECOMMENDED STREAM RESOURCE MAINTENANCE FLOWS ON SEVEN SOUTHERN IDAHO STREAMS. U.S. Fish Wildl. Serv. Instream Flow Inf. Pap. No. 8. vii + 60p. June 1978. SFA 24(2)

[2036 NW 12th, Meridian, ID] This paper documents the results of instream flow investigations conducted on seven south Idaho streams by the Boise Ecological Services Field Office during 1972 to 1975. The results were reanalyzed by the Cooperative Instream Flow Service Group using the concept of probability-of-use curves which are based on weighted criteria for depth and velocity. Recommended stream resource maintenance flows by month are presented.

79-001578 Terrell, T. T.; McConnell, W. J. , (eds.) STREAM CLASSIFICATION 1977: PROCEEDINGS OF A WORKSHOP HELD AT PINGREE PARK, COLORADO, 10-13 OCTOBER 1977. U.S. Fish Wildl. Ser. FWS/OBS-78/23. 45p. Apr. 1978. SFA 24(2)

[U.S. FWS, 2625 Redwing Rd., Fort Collins, Co 80521]

79-001579 Terrell, T. T.; McConnell, W. J. , (eds.) STREAM CLASSIFICATION 1977: PROCEEDINGS OF A WORKSHOP HELD AT PINGREE PARK, COLORADO 10-13 OCTOBER 1977. U.S. Fish Wildl. Serv. FWS/OBS-78/23. 45p. Apr. 1978. SFA 24(2)

[U.S. FWS, 2625 Redwing Rd., Fort Collins, CO 80521]

79-001580 Wydoski, R. S.; Duff, D. A. INDEXED BIBLIOGRAPHY ON STREAM HABITAT IMPROVEMENT. U.S. Dep. Interior Bur. Land Manage. Tech. Note 322. 34p. Oct. 1978. Available from DSC, Fed. Cent. Bldg. 50, Denver, CO 80225. SFA 24(2)

FARM POND AND SMALL IMPOUNDMENT MANAGEMENT

79-001581 Bivings, A. E. IV; Noble, R. L.; Quinn, R. E. GROWTH OF LARGEMOUTH BASS FOLLOWING VEGETATION CONTROL AND THREADFIN SHAD INTRODUCTION. Annu. Proc. Tex. Chap. Am. Fish. Soc. 1: 25-35. 1979[1978]. SFA 24(2)

[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station] A 15-ha pond in northeast Texas was treated with an herbicide to control aquatic vegetation and was subsequently stocked with threadfin shad. Total lengths back-calculated from scales of largemouth bass indicated that first-year growth of the three year classes following initiation of management was significantly greater than that of previous year classes. No significant differences in length were observed at annulus II. The management practices had the primary effect of reducing the time required for bass to reach catchable size. Because of similarities in growth increments among years, effects of vegetation control and threadfin shad introduction could not be differentiated.

79-001582 Panek, F. M. EFFECTS OF PREDATOR STOCKING ON A LARGEMOUTH BASS-BLUEGILL POND FISHERY. Fla. Sci. 41 (4): 252-255. 1978. SFA 24(2)

[N.Y. State Dep. Environ. Conserv., State Office Bldg., Watertown 13601] After a predator fish (/Esox niger/) was stocked in a 0.23 ha New Jersey pond, there occurred a decrease in population size and standing crop of bluegill (/Lepomis macrochirus/), an increase in abundance and standing crop of largemouth bass (/Micropterus salmoides/), and an increase in the potential harvestability of the fish community. Schumacher-Fschmeyer population estimates for bluegill indicated a 72.9 percent decrease in abundance 1 yr after stocking chain pickerel (/Esox niger/). At the same time, largemouth bass increased 22.2 percent in abundance. Standing crop of bluegill decreased 49.2 percent; that of the largemouth bass increased 24.4 percent. Biological balance (P/C) decreased from 9.5-2.1 and potential harvestibility (A(t)) increased from 38.1-76.5 percent from 1970 to 1972.

LARGE IMPOUNDMENT MANAGEMENT & RESEARCH

79-001583 Barr, W. C. THE USE OF COVE ROTENONE STUDIES FOR FISHERIES MANAGEMENT IN SOUTHERN RESERVOIRS. Ph.D dissertation, Univ. Tenn. 195p. 1978. From Diss. Abstr. Int. B Sci. Eng. 39(6):2639. Dec. 1978. SFA 24(2)

This study quantitatively assessed the efficacy of using rotenone, a piscicide, to study the fish community residing in southern warm-water reservoirs. A standard methodology is proposed. A series of approximately 800 cove rotenone samples, made using the suggested standard procedure, were analyzed. Ten cove rotenone samples revealed approximately 79 percent of the fish species present in a reservoir. Analyses of species frequency in rotenone samples showed the dominant reservoir fish community to be composed of about 29 species. The presence of large numbers of older gizzard shad in several reservoirs indicated underexploitation of the forage fish resourse. It was suggested that this number of older forage fish (unavailable prey biomass) be subtracted from the forage base before estimating the forage/carnivorous ratio for southern reservoirs. The results indicated that cove rotenone samples must be done in all areas of the reservoir to provide a meaningful estimate of the fishery. At the same

79-001583 CONTINUED
time, cove samples showed less sample bias than either gill net or electrofishing samples. A single rotenone sample consistently showed 20 or more fish species present than did 10 gill net or 10 electrofishing samples. However, the technique does not effectively sample large pelagic fish species such as striped bass.--From abstr.

79-001584 Kirka, A.; Bastl, I.; Holcik, J. ICHTYOCENOZY POVODIA VAHU V OBLASTI NADRZE LIPTOVSKA MARA, PROGNOZA FORMOVANIA JEJ ICHTYOFAUNY A NAVRH NA PRVOTNE ZARYBNENIE. [ICHTYOCCENOSIS OF THE VAH BASIN IN THE REGION OF LIPTOVSKA MARA, PROGNOSIS FOR ICHTYOFAUNA DEVELOPMENT AND SUGGESTION FOR INITIATING FISHERIES THERE.] Biol. Pr. 22 (4): 8-79. 1976. In Czech with English and Russian summ. SFA 24(2)

79-001585 Wiley, R. W. TRENDS IN FISH POPULATION, 1963 THROUGH 1976--14 YEARS OF GILLNETTING, FLAMING GORGE RESERVOIR. Wyo. Game Fish Dep. Fish. Res. Rep. Monogr. Ser. No. 1. p. 17-29. July 1978. SFA 24(2)
[Wyo. Game Fish Dep., Laramie] Gillnets were set throughout Flaming Gorge Reservoir in littoral areas through 14 years (1963-1976). Nets were set for periods of 20 to 24 hours (overnight) and all trout were weighed and measured while numbers of non-game fish processed was dependent on number netted. Rainbow trout were most abundant in the net catches to 1965. After that time production began to favor non-game fishes, most notably Utah chub, flannelmouth sucker and white sucker. The decline in abundance of rainbow trout is attributable to fishing effort and competition with non-game fishes and large predator trout. Introduction of forage fishes to compete with non-game fish and to provide forage for rainbow trout have been considered.

MARINE MANAGEMENT & RESEARCH

79-001586 Altukhov, Yu. P. RATIONAL MANAGEMENT OF MARINE BIOLOGICAL RESOURCES IN THE LIGHT OF POPULATION GENETICS. In S. Motoda, ed. Propagation of Marine Resources of the Pacific Ocean. First Japan-USSR Joint Symp. Aquacult. Pac. Ocean: 1-4 Dec. 1972, Tokyo and Shimizu, Japan. p. 31-39. Sept. 1973. SFA 24(2)
[Inst. Mar. Biol., Vladivostok, USSR]

79-001587 Andersen, K. P.; Ursin, E. A MULTISPECIES EXTENSION TO THE BEVERTON AND HOLT THEORY OF FISHING, WITH ACCOUNTS OF PHOSPHORUS CIRCULATION AND PRIMARY PRODUCTION. Medd. Dan. Fisk.- Havunders. 7: 319-435. 1977. SFA 24(2)
[Danish Inst. Fish. Mar. Res., Charlottenlund Castle, Charlottelund, Denmark] Interaction between species in a marine ecosystem is described by expressions for food consumption and grazing mortality which are consistent with each other and with the Beverton and Holt model of the population dynamics of individual species. A model of primary production is introduced in order to make possible an account of nutrient circulation (as examplified by phosphorus) within and nutrient flow through the system. It is demonstrated in an application to North Sea fisheries that recent changes in total yeild can be described in some detail under the terms of the model as a function of fishing mortality alone. The composition of the North Sea fauna in the virgin state is discussed and also the conditions under which total yield could be increased above the 1970 level.

79-001588 Brown, B. F.; Brennan, J. A.; Palmer, J. E. LINEAR PROGRAMMING SIMULATIONS OF THE EFFECTS OF BYCATCH ON THE MANAGEMENT OF MIXED SPECIES FISHERIES OFF THE NORTHEASTERN COAST OF THE UNITED STATES. NOAA Fish. Bull. 76 (4): 851-860. 1979. SFA 24(2)
[NMFS, Woods Hole, MA 02543] We evaluated the results of using historic bycatch (incidental catch) ratios in adjusting fishing regulations by linear programming techniques. We used both 1971 and 1973 bycatch ratios separately to assess the sensitivity of the results to the reported changes in bycatch ratios in estimating the total 1975 catch of countries fishing in the northwest Atlantic. For 4 of the 11 countries for which data were examined, the difference between the percentage of a country's species total allowable catches (i.e., those catches allowed a country by regulation) using the 1971 and 1973 bycatch ratios, was at least 20 percent. Only four countries were predicted to catch at least 80 percent of their species total allowable catches. The predicted total catches of all countries and all species was only 60 percent of the total species quotas. The simulated directed fisheries constituted only 70 percent of the total catch using 1971 bycatch ratios and only 73 percent using 1973 bycatch ratios. Examination of the reported 1975 catches indicated that the total allowable catches for herring were most frequently limiting a country's catch. Except for U.S.S.R., the differences between reported and simulated catches were less than 50 metric tons, with the difference less than 10 metric tons for 6 of the 11 countries. There was little difference in reported versus simulated catches between the schemes using the 1971 and 1973 bycatch ratios.

79-001589 FAO of the UN COOPERATIVE INVESTIGATIONS OF THE CARIBBEAN AND ADJACENT REGIONS - II. SYMPOSIUM ON PROGRESS IN MARINE RESEARCH IN THE CARIBBEAN AND ADJACENT REGIONS. CARACAS, VENEZUELA, 12-16 JULY 1976. PAPERS ON FISHERIES, AQUACULTURE AND MARINE BIOLOGY. FAO Fish. Rep. No. 200. viii + 547p. Dec. 1977. SFA 24(2)
[Rome, Italy]

79-001590 FAO of the UN REPORT OF THE FIFTH SESSION OF THE INDIAN OCEAN FISHERY COMMISSION. COCHIN, INDIA, 19-26 OCTOBER 1977. FAO Fish. Rep. No. 199. v + 36p. 1977. SFA 24(2)
[Rome, Italy]

79-001591 FAO of the UN REPORT OF THE SIXTH SESSION OF THE INDIAN OCEAN FISHERY COMMISSION EXECUTIVE COMMITTEE FOR THE IMPLEMENTATION OF THE INTERNATIONAL INDIAN OCEAN FISHERY SURVEY AND DEVELOPMENT PROGRAMME. COCHIN, INDIA, 17-18 OCTOBER 1977. FAO Fish. Rep. No. 198. v + 12p. Nov. 1977. SFA 24(2)
[Rome, Italy]

79-001592 FAO of the UN REPORT OF THE NINTH SESSION COORDINATING WORKING PARTY ON ATLANTIC FISHERY STATISTICS DARTMOUTH, CANADA, 17-23 AUGUST 1977. FAO Fish. Rep. No. 197. 40p. 1977. SFA 24(2)
[Rome, Italy]

79-001593 FAO of the UN REPORT OF THE ELEVENTH SESSION OF THE COMMITTEE ON FISHERIES. ROME, 19-26 APRIL 1977. FAO Fish. Rep. No. 196. x + 48p. June 1977. SFA 24(2)
[Rome, Italy]

79-001594 FAO of the UN REPORT OF THE FIFTH SESSION OF THE FISHERY COMMITTEE FOR THE EASTERN CENTRAL ATLANTIC (CECAF) LOME, TOGO, 7-11 MARCH 1977. FAO Fish. Rep. No. 195. vi + 51p. 1977. SFA 24(2)
[Rome, Italy]

79-001595 FAO of the UN REPORT OF THE FOURTH JOINT MEETING OF THE INDO-PACIFIC FISHERIES COUNCIL SPECIAL COMMITTEE ON MANAGEMENT OF INDO-PACIFIC TUNA FOURTH SESSION AND THE INDIAN OCEAN FISHERY COMMISSION COMMITTEE ON MANAGEMENT OF INDIAN OCEAN TUNA FIFTH SESSION COLOMBO, SRI LANKA, 29-30 OCTOBER 1976. FAO Fish. Rep. No. 190. v + 12p. 1977. SFA 24(2)
[Rome, Italy]

79-001596 Hill, G. D., Jr. ONE YEAR OF THE 200-MILE LIMIT. Fisheries (Bull. Am. Fish. Soc.) 3 (4): 10, 12. July-Aug. 1978. SFA 24(2)

79-001597 Lenarz, W. H.; Zweifel, J. R. A THEORETICAL EXAMINATION OF SOME ASPECTS OF THE INTERACTION BETWEEN LONGLINE AND SURFACE FISHERIES FOR YELLOWFIN TUNA, /THUNNUS ALBACARES/. NOAA Fish. Bull. 76 (4): 807-825. 1979. SFA 24(2)
[NMFS, 3150 Paradise Dr., Tiburon, CA 94920] This paper explores several aspects of a dual fishery (surface and longline) on yellowfin tuna, /Thunnus albacares/. The work is exploratory in nature and results, though indicative, are not conclusive for any specific fishery. Our results indicate that the yield per recruit is higher for the longline fishery than for surface gear if all fish are available to both gears and higher for the combined gears than for either gear fishing alone. The effect of fishing by one gear on yield to the other gear and the effect of the fishery on stock fecundity is shown to be greater for the often assumed 1:1 sex ratio than for the ratios usually observed. A simulation model was used to examine the interrelations of pattern of movement of fish, pattern of recruitment, and fishing strategy. It was assumed that movements were random and recruitment occurred either only along the coast or throughout the fishing area. The results indicated that either of these patterns of recuitment could allow for increased catch as the surface fleet moved offshore. However, location or pattern of recruitment is shown to be important when measuring natural mortality and for examining the potential of a localized fishery, primarily on younger fish, relative to a fishery exploiting the full range of the stocks or to one taking primarily older fish. Tagging and fecundity studies are suggested for further investigation of the questions examined in this paper.

79-001598 Matsumae, S. [UNLIMITED RESOURCES OF THE PACIFIC OCEAN.] In S. Motoda, ed. Propagation of Marine Resources of the Pacific Ocean. First Japan-USSR Joint Symp. Aquacult. Pac. Ocean: 1-4 Dec. 1972, Tokyo and Shimizu, Japan. p. 3. Sept. 1973. In Japanese. SFA 24(2)
[Tokai Univ., Tokyo, Japan]

79-001599 Moiseev, P. A. [BIOLOGICAL RESOURCES OF THE PACIFIC OCEAN.] In S. Motoda, ed. Propagation of Marine Resources of the Pacific Ocean. First Japan-USSR Joint Symp. Aquacult. Pac. Ocean: 1-4 Dec. 1972, Tokyo and Shimizu, Japan. p. 5-6. Sept. 1973. In Russian and Japanese. SFA 24(2)
[VNIRO, Moscow, USSR]

79-001600 Newman, G. THE LIVING RESOURCES OF THE SOUTHEAST ATLANTIC. FAO Fish. Tech. Pap. No. 178. viii + 59p. 1977. SFA 24(2)
[Sea Fish. Br., Dep. Industries, Private Bag Sea Point, Cape Town, South Africa]

79-001601 Ricker, W. E.; Bilton, H. T.; Aro, K. V. CAUSES OF THE DECREASE IN SIZE OF PINK SALMON (/ONCORHYNCHUS GORBUSCHA/). Fish. Environ. Can. Fish. Mar. Serv. Tech. Rep. No. 820. vii + 93p. Sept. 1978. In English with French summ. SFA 24(2)
[Fish. Mar. Serv., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

79-001602 Yamamoto, K. [ENDOCRINOLOGICAL STUDIES RELATED TO ARTIFICIAL PROPAGATION OF FISH.] In S. Motoda, ed. Propagation of Marine Resources of the Pacific Ocean. First Japan-USSR Joint Symp. Aquacult. Pac. Ocean: 1-4 Dec. 1972, Tokyo and Shimizu, Japan. p. 13-29. Sept. 1973. In Japanese with English summ. SFA 24(2)
[Fac. Fish., Hokkaido Univ., Hakodate, Japan]

MISC. TECHNIQUES AND EQUIPMENT

79-001603 Cadwallader, P. L. EFFECT OF FORMALIN ON THE LENGTH AND WEIGHT OF /GALAXIAS VULGARIS/ (PISCES: SALMONIFORMES: GALAXIIDAE). Mauri Ora 2: 63-66. 1974. SFA 24(2)
[Fish Wildl. Div., Minist. Conserv., 632 Bourke St., Melbourne, Victoria, Australia 3000] The effect of 10 percent formalin on the length and weight of /Galaxias vulgaris/ was examined at intervals over a period of 245 days. The greatest changes occurred during the first 24 hours, length decreasing to 95.15 percent of the live length, whereas weight increased to 106.98 percent of the live weight. Length continued to decrease at a much slower rate throughout the experiment. However, after the initial sharp increase, weight slowly decreased towards the initial live value.

79-001604 Kuhn, D. L.; Plafkin, J. L.; Cairns, J., Jr. A SYSTEM FOR RECORDING AND PROCESSING TAXONOMIC DATA. Water Resour. Bull. 14 (6): 1507-1509. Dec. 1978. SFA 24(2)
[Biol. Dep., VPI&SU, Blacksburg, VA 24061] A system in which taxonomic information is recorded in a form that can be directly utilized by computer is described. How such a system can greatly facilitate the aquisition and analysis of data is also discussed.

79-001605 McMahon, T. E.; Tash, J. C. EFFECTS OF FORMALIN (BUFFERED AND UNBUFFERED) AND HYDROCHLORIC ACID ON FISH OTOLITHS. Copeia 1979 (1): 155-156. 20 Feb. 1979. SFA 24(2)
[Ariz. Coop. Fish. Res. Unit, Univ. Ariz., Tucson 85721]

REVIEWS, BIBLIOGRAPHIES, ETC.

79-001606 Klement, A. W., Jr.; Schultz, V. TERRESTRIAL AND FRESHWATER RADIOECOLOGY. A SELECTED BIBLIOGRAPHY. U.S. Dep. Energy TID-3910-512. iv + 137p. 1978. Available at 7.25 (paper) and 3.00 (microfiche) from NTIS, Springfield, VA 22161. SFA 24(2)
[Dep. Zool., Wash. State Univ., Pullman]

79-001607 Rogers, D. J. , (compiler) A BIBLIOGRAPHY OF AFRICAN ECOLOGY. A GEOGRAPHICALLY AND TOPICALLY CLASSIFIED LIST OF BOOKS AND ARTICLES. Afr. Bibliogr. Cent. Spec. Bibliogr. Ser. New Ser. No. 6. xxi + 499p. 1979. SFA 24(2)
[Dep. Biol., Augustina Coll., Sioux Falls, SD]

79-001608 Utah Division of Wildlife Resources; Ecological Consultants, Inc. , (compilers) ANNOTATED BIBLIOGRAPHY OF NATURAL RESOURCE INFORMATION: SOUTHERN UTAH. U.S. Fish Wildl. Serv. FWS/OBS-77/34. vi + 246p. Sept. 1977. SFA 24(2)
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